THE JOURNAL OF SPEECH AND HEARING DISORDERS

Volume 18 December 1953 Number 4

Norms on a Screening Test of Articulation for Ages Three Through Eight
MILDRED C. TEMPLIN 323

The Relationship Between Articulation and Other Developmental Factors in Children
RODNEY W. EVERHART 332

Speech Examination of a Group of Institutionalized Mentally Handicapped Children
BERNARD B. SCHLANGER 339

Group Therapy with Preschool Children Having Cerebral Palsy
OLLIE BACKUS and RUTH COFFMAN 350

Possibilities of Research for Public School Speech Therapists
MILDRED C. TEMPLIN 355

Audiometric Testing of Hearing of School Children
SAMUEL M. WISHIK and ELIZABETH R. KRAMM 360

Group Auditory Training Unit for Preschool Children
TINA E. BANGS and JAMES L. SHAPLEY 366

The Eyeblink Response as a Test for Hearing
ROBERT GALAMBOS, PHILIP E. ROSENBERG and ARAM GLORIG 373

The Threshold Reliability of Recorded Sustained Vowels
WILLIAM R. TIFFANY 379

Adaptation to Delayed Side-Tone
CHESTER J. ATKINSON 386

Letter to the Editor 392

Book Reviews, 393 Abstracts, 397

News and Announcements, 401

Convention Program, 406

Index to Volume 18, 412

EDUCATION LIBRARY

THE AMERICAN SPEECH AND HEARING ASSOCIATION

OFFICERS

President	S. Richard Silverman, Ph.D., Cen. Inst. for the Deaf
Executive Vice-President	Ernest H. Henrikson, Ph.D., Univ. of Minnesota
Vice-President	Margaret Hall Powers, Ph.D., Chicago Pub. Schls.
Secretary-Treasurer	George A. Kopp, Ph.D., Wayne University
Editor	Grant Fairbanks, Ph.D., University of Illinois

OFFICERS-ELECT

President-Elect	Margaret Hall Powers, Ph.D., Chicago Pub. Schls.
Vice-President-Elect	Gordon E. Peterson, Ph.D., University of Michigan

COUNCIL

The Officers and the following Councilors:

Stanley H. Ainsworth, Ph.D.	James F. Curtis, Ph.D.
Ollie Backus, Ph.D.	Eugene T. McDonald, Ph.D.
Raymond Carhart, Ph.D.	Charles Van Riper, Ph.D.
James A. Carrell, Ph.D.	Harold Westlake, Ph.D.
Myfanwy E. Chapman, M.S.	

APPLICATIONS FOR MEMBERSHIP SHOULD BE ADDRESSED TO THE SECRETARY-TREASURER

THE JOURNAL OF SPEECH AND HEARING DISORDERS

EDITOR

Grant Fairbanks, Ph.D.

ASSISTANT TO THE EDITOR

Elaine Pagel Paden, Ph.D.

ASSOCIATE EDITORS

Stanley H. Ainsworth, Ph.D.	Claude E. Kantner, Ph.D.
Clinical and School Problems	*Voice and Articulation Disorders*
Spencer F. Brown, M.D.	*Phonetics*
Psychological Problems	Hildred Schuell, Ph.D.
Medical Problems	*Organic Speech Disorders*
James F. Curtis, Ph.D.	S. Richard Silverman, Ph.D.
Speech Science	*Hearing Disorders*
Statistical Problems	*Psychoacoustics*

ASSISTANT EDITORS

Charles R. Elliott, M.A.	Martin F. Palmer, Sc.D.
News and Announcements	*Records*
Jack Matthews, Ph.D.	Kenneth Scott Wood, Ph.D.
Abstracts	*Book Reviews*

BUSINESS MANAGER

George A. Kopp, Ph.D.

MANUSCRIPTS and related correspondence should be addressed to: Grant Fairbanks, Editor, *Journal of Speech and Hearing Disorders*, 321 Illini Hall, University of Illinois, Urbana, Illinois.

SUBSCRIPTIONS and orders for back numbers should be addressed to: George A. Kopp, Business Manager, *Journal of Speech and Hearing Disorders*, Speech Clinic, Wayne University, Detroit, Michigan.

NEWS and announcements should be addressed to: Charles R. Elliott, School of Speech, Northwestern University, Evanston, Illinois.

NOTICE TO AUTHORS

Before submitting manuscripts for publication authors should consult Information for Contributors to the Journal of Speech and Hearing Disorders, *JSHD*, 14, 1949, 93-94. Prospective authors are invited to write the Editor for copies of this Note, and of its supplement, Examples of Manuscript Form.

Norms On A Screening Test Of Articulation For Ages Three Through Eight

Mildred C. Templin

THE PURPOSE for which articulation is measured should determine the kind of measurement used. A diagnostic test is used to obtain a complete appraisal of the accuracy and inaccuracy of articulation of specific speech sounds. A screening test is used for identifying satisfactory or unsatisfactory articulation in order to locate children who would benefit from special therapy or training. A screening test may be used to detect probable speech deviates through public school speech surveys or as part of a battery of tests in medical or psychological examinations.

A screening test of speech sound articulation devised by the author was published in 1947 (*8*). This test consists of 50 sound elements selected as most discriminative between good and poor articulation by the Lawshe nomograph technique of item analysis. These 50 items were used in the construction of sentence and word screening tests. The test-retest reliability coefficients between two measurements made eight days apart ranged from .93 to .99 on single age groups between two and five years for both tests. The coefficients between the scores on the word and sentence tests obtained at a single session ranged from .97 to .99. Since the agreement between the word and sentence tests was very high, the word test was used for all further work because it is more easily and quickly administered without any loss in accuracy of measurement. The 50 items are a valid screening device if the diagnostic test consisting of 113 speech sounds can be considered a valid measure of articulation. The correlations of the 113-item diagnostic test and the 50-item screening test with C.A. are .64 and .64, and with M.A. are .70 and .71.

The usefulness of this screening test of articulation has been limited since the performance of a representative sample of subjects at various age levels has not been published. This paper presents normative data and validity data obtained since the construction of the screening test. The data were obtained as part of a larger study of the development and the

Mildred C. Templin (Ph.D., Minnesota, 1947) is Associate Professor, Institute of Child Welfare, University of Minnesota. The data presented are part of a larger study of language development in children supported by a grant-in-aid from the Parent's Institute Research Fund of the Graduate School, University of Minnesota. The following persons tested various numbers of children in their own communities: Dorothy Bohannon, Rosemary Calogne, Josephine A. Evans, Edna Gilbert, Arthur Kaltenborn, Kathryn Kirk, Dorothy Kirkland, Thelma Knudson, Ruth Lillibridge, J. Laguaite, Ruth Proctor, Vivian Roe, S. Simon, Ina Stannard, Jean Todd, Mrs. Homer Ulrich, Mrs. Hal Woods.

interrelationships of language skills in children.

The 480 subjects ranging in age from three through eight years were all singletons, white, of normal intelligence, and with no gross evidence of hearing impairment. They were enrolled in 14 public schools and 21 nursery schools in Minneapolis and St. Paul. Some of the children under five were tested in their homes. Sixty children, 30 boys and 30 girls, were selected at each half year from three through five and at each year from five through eight to form a representative sample according to father's occupation. Since language growth is more rapid at the younger ages, measures at closer age intervals are necessary to give an adequate picture of development. The total age range coincides approximately with the child's early use of language as communication in an adult manner to his achievement of mature articulation. The children were tested within one month of their designated ages. Thus, three-year-old children ranged in age from two years, eleven months to three years, one month at the time of testing.

Intelligence test scores were available for the six-, seven-, and eight-year-old children. Most of these were based on Stanford-Binet tests administered by kindergarten teachers. A mean I.Q.–equivalent calculated from the Ammons Vocabulary test was taken as a rough measure of intelligence for children five years old and younger (*1*). The mean I.Q. of the six- to eight-year-old sample is 107.0 $\pm$ 13.1. The differences between the I.Q.'s of the boys and the girls is not statistically significant ($CR = 1.32$). The mean I.Q.-equivalent for the combined sexes from three through five is 114.8 $\pm$ 18.8. This estimate is probably high since the subjects were selected to form a representative sample with the same care as the older children.

A diagnostic measure of the articulation of 176 speech sound elements in words was obtained on all the subjects. From these 176 elements, the

TABLE 1. Product-moment correlations between articulation tests and various criterion measures at each age level. (*N*, each age, 60)

	Chronological Age							
	3	3½	4	4½	5	6	7	8
Screening Test versus:								
Complete Test	.94	.96	.96	.95	.98	.97	.97	.95
Initial Consonants	.88	.91	.86	.85	.90	.92	.89	.85
Medial Consonants	.88	.90	.84	.81	.93	.88	.81	.82
Final Consonants	.81	.82	.81	.79	.91	.84	.86	.69
Total Words	.57	.37	.29	.29	.52	.43	.17	.18
Different Words	.63	.47	.43	.34	.61	.33	.26	.19
Complete Test versus:								
Initial Consonants	.90	.87	.86	.78	.89	.92	.90	.81
Medial Consonants	.92	.94	.83	.81	.92	.93	.84	.74
Final Consonants	.91	.88	.87	.84	.93	.89	.89	.68
Total Words	.62	.41	.27	.26	.52	.45	.23	.18
Different Words	.65	.53	.41	.34	.62	.34	.24	.19

TABLE 2. Differences between upper and lower socio-economic groups on screening and complete articulation tests at separate age levels.

	Screening Test					*Diagnostic Test*				
	Upper SE (N=18)		*Lower SE (N=42)*			*Upper SE (N=18)*		*Lower SE (N=42)*		
C.A.	*M*	*SD*	*M*	*SD*	*CR*	*M*	*SD*	*M*	*SD*	*CR*
3	21.5	13.2	21.2	13.3	0.07	97.6	33.1	91.5	34.0	0.65
3½	28.8	13.6	27.4	14.8	0.27	115.9	31.1	110.1	36.5	0.63
4	37.3	7.3	33.2	11.9	1.63	136.1	18.9	122.2	31.8	2.09
4½	38.7	11.6	34.6	12.1	1.23	141.7	29.8	123.8	29.9	2.13
5	41.6	9.4	36.0	14.8	1.74	146.9	26.8	130.3	39.1	1.89
6	42.1	11.9	38.8	14.6	0.90	154.5	28.6	140.4	42.7	1.50
7	48.2	4.3	42.7	12.1	2.56	167.8	11.4	151.4	38.9	2.50
8	48.8	2.2	47.5	5.0	1.45	169.7	7.3	166.0	12.3	1.46

50 making up the screening test were scored separately. Since 50 of the same items are included in both scores, the correlations between the two measures are somewhat increased.

Results

Although no additional data on the reliability of the screening test has been gathered since its publication, the validity has been studied further. In Table 1 coefficients of correlation between the 50-item screening test and the 175-item diagnostic test of articulation and between each of these tests and other criteria are presented for the sexes combined at each age level. Considering the diagnostic test a valid measure of articulation, the screening test is also valid since the lowest correlation between them at any single age level is .94. If single sexes as well as single age levels are considered, the correlations range between .95 and .98 for boys and between .93 and .97 for girls.

The correlations are similar between the various criteria and either the screening or the diagnostic test of articulation. When accuracy of production of either the initial, medial or final consonants is used as the criterion, the differences between the 24 pairs of correlations is not great: 16 of the pairs differ .04 points or less; five pairs .05 to .06 points; and only three pairs differ .08 points or more. Two outside criteria used are the total number of words and the number of different words uttered by a child in 50 verbalizations with an adult in the room. Here, too, the magnitude of the correlations between each articulation test and these criteria is very similar.

Investigations of language development report children from the upper socio-economic groups somewhat accelerated over those from the lower socio-economic groups (*3*, 7). In the present study the subjects were divided into upper and lower socio-economic groups according to the Minnesota Scale of Occupations (*4*). At each age level, the 18 subjects whose father's occupations were classified at Class I, professional, Class II, managerial, Class III, skilled and major clerical workers and retail businessmen (the three highest occupational

TABLE 3. Mean and median scores on screening test at separate age levels.

C.A.	Girls		Boys		Both Sexes			
	M	*SD*	*M*	*SD*	*M*	*SD*	*Mdn*	*Q*
3	20.1	12.9	22.5	13.5	21.3	13.2	21.0	11.8
3½	30.5	13.1	25.1	15.2	27.8	14.2	30.0	14.0
4	34.2	10.6	34.7	11.2	34.4	10.9	37.0	6.0
4½	37.3	10.3	34.3	13.4	35.8	11.8	40.5	9.5
5	40.6	12.0	34.7	14.5	37.7	13.3	42.5	12.5
6	44.3	8.7	38.5	13.8	41.4	11.3	47.0	10.0
7	47.8	3.9	44.0	8.4	45.9	6.2	49.0	4.5
8	47.9	4.6	47.8	4.2	47.8	4.4	49.5	1.0

classifications), were placed in the upper socio-economic group. The remaining 42 subjects at each age level constitute the lower socio-economic group. The occupations of the fathers of these subjects were in the three lowest occupational classifications, Class V, semi-skilled, minor business and clerical workers, Class VI, slightly skilled operatives, and Class VII, unskilled labor.

At each age level the upper socio-economic group receives the higher score on both the screening and the diagnostic tests (Table 2). On the whole, the differences between the scores are not statistically significant. At four and at four-and-a-half years the differences on the diagnostic test reach the five per cent level of confidence. At seven years of age for both the screening and the diagnostic tests the differences reach the two per cent level of confidence, but at eight years the differences are not significant. The lower socio-economic subjects take about one year longer than those from the upper socio-economic groups to reach essentially mature articulation. This is found for both screening and diagnostic tests.

The mean scores on the screening test show a fairly steady increase with age (Table 3). The samples of boys at four and four-and-a-half years, despite their careful selection, appear to be somewhat atypical since, unlike the samples of girls and contrary to general observation, there is little increase in mean scores between the ages of four and five years. On the diagnostic test, too, there is little increase in mean scores at these ages for the boys. The means and standard deviations for the boys at four, four-and-a-half and five years on the diagnostic test are: 127.2 ± 31.6, 127.2 ± 32.2, and 128.8 ± 38.1.

There is no consistency from age to age in either boys or girls receiving the higher score on the screening test. Only at seven years does the difference between the sexes reach the five per cent level of confidence ($CR=2.25$). At all other age levels the differences between boys and girls are not statistically significant (CR's range from 0.18 to 1.95). The girls tend to be accelerated in articulation development from about four-and-a-half years on. By seven years they approximate mature articulation while boys take another year to reach the same degree of proficiency. This finding holds for the diagnostic measure with the sample in the present study and substantiates the results of Poole's study with a sample of children in the

FIGURE 1. Scattergrams of scores on screening and complete articulation tests for each age.

University of Michigan Laboratory schools (*5*).

As would be expected, the scores on the screening test are skewed away from the maximum score, particularly at the older age levels. The medians and the quartile deviations for each age tested are presented in Table 3. Age for age, after three years, the median scores are considerably higher than the mean scores.

The screening test of articulation is used to select subjects whose articulation of speech sounds, since it is probably defective, needs to be studied further. An important attribute of a satisfactory screening device is that it agree closely with a complete and independent measure of the same function. Although the two articulation measures are not independent, the extent of the agreement between them is presented graphically in Figure 1 where, for each age level separately, the score of each case on the diagnostic test is plotted against his score on the screening test.

In order that a screening device be most useful a critical or cutting score which separates adequate from inadequate performance must be determined. Such a cutting score may be established in a variety of ways. The cutting scores on the screening test were determined arbitrarily and empirically at each age level. The plot of each of the coordinate distributions was examined and a tentative ordinate and abscissa erected so that a minimum number of cases fell in the upper left and lower right quadrants. After this had been done at each age level, all distributions were considered together and adjustments made in the point of erection of the axes after considering the form of the distributions, the mean, standard deviation, median and quartile deviation of the screening test, and the approximate level of development of articulation to be expected at each age.

For each age distribution in Figure 1 the horizontal axis has been erected at the cutting score on the screening test at or below which the probability of defective articulation is high; the verticle axis is erected at that score on the complete test below which the scores of approximately the same percentage of children fall. Only at the three year level are the percentages not identical; here one more subject is included on the complete test since two children received identical scores.

The varying percentage of children selected for further study at different ages reflects the attempt to recognize the progress toward accuracy of articulation with increasing age. At eight years of age, when essentially mature articulation has been achieved by most children, the cutting score is set at a definite break in the distribution above which about eight per cent of the subjects fall. This closely approximates the percentage of children reported to have articulatory defects by the White House Conference Committee (*9*). As cutting scores were set at the younger ages the percentage of cases selected for further study was increased to take into account the larger standard deviations of the distributions of screening test scores, and to recognize the continuing improvement of articulation skill.

Ideally, cutting scores should be such that the screening and the diagnostic tests agree that articulation is adequate or inadequate. Those cases falling into the upper right or the lower left quadrants in each distribution represent agreement between the two measures; those falling into the

upper left or the lower right quadrants indicate disagreement. When there is disagreement between the two measures, either some cases needing further study according to their scores on the diagnostic test are not identified by the screening test, or cases selected by the screening test are found to have satisfactory articulation when the diagnostic test is given. Cases in the lower right quadrant received scores below the cutting point on the screening test, but above the cutting score on the diagnostic test. These cases are sometimes called false positives, since they are tentatively labeled as probably speech defective, but further study shows this classification to be in error. Those cases in the upper left quadrant are misses since they are judged adequate in articulation by the screening test, but further study showed them to be defective in articulation (2).

Since, practically, the ideal of complete agreement between the screening measure and the diagnostic measure is never attained, the cut-off scores were selected in the direction of the higher scores so that more false positives would be identified and fewer cases with poor articulation would be missed. While this represents extra work for the tester, it also insures that children needing speech therapy will be more likely to be selected by the screening device.

In Table 4, the suggested cutting scores and the percentage of children receiving those or lower scores are given for each age level. The score suggested for eight years old is useable with older children, since by this age development toward accurate articulation of speech sounds may be assumed completed for most children. For the sample in the present study, had the suggested cutting scores been used, six cases identified as having poor articulation on the diagnostic test would have been missed. Three of these are at the three year level where a screening test of articulation would be used infrequently. For the older ages where the test would more likely be used, only one case would have been missed at four, four-and-a-half and five years, respectively. Only six cases identified for further study by the screening test scored as false positives on the diagnostic: two at three, and one at four, four-and-a-half, five and seven years, respectively.

TABLE 4. Cut-off score on screening test at each age level.

C.A.	Cut-Off Score	Subjects at or below Cut-Off Score	
		Number	Per Cent
3	12	17	28
3½	18	16	27
4	23	9	15
4½	26	12	20
5	31	14	23
6	34	11	18
7	39	7	12
8	44	5	8

When work on the development of norms was begun, speech correction teachers in several cities cooperated by giving the screening test to children in their own communities. The number of children tested by any one person ranged from 20 to 489. Information on the age of the children and the occupation of their fathers was obtained. Unfortunately, in many instances, the father's place of work rather than his type of work was given. Whenever father's occupation was precisely stated, it was classified according to the Minnesota Occupational scale. From these cases five-, six- and seven-year-old samples were drawn. The 80 five-year-olds ranged in age

from four years, seven months to five years, six months; the 110 six-year-olds from five years, seven months to six years, six months; and the 57 seven-year-olds from six years, seven months to seven years, six months. In each group approximately twice as many cases were from the lower socio-economic group (Classes V, VI, and VII) as were from the upper socio-economic group (Classes I, II, III). This proportionate division into upper and lower socio-economic groups is similar to that of the normative sample. The lower socio-economic groups, however, are selected upward since most of the cases included are in Class V, somewhat fewer in Class VI, and very few in Class VII. The median scores are 48 for the five-year-olds and 49 for the six- and seven-year-olds.

When the cutting scores are applied, eleven cases or 13.8 per cent of the five-year-olds, sixteen or 14.5 per cent of the six-, and five or 8.7 per cent of the seven-year-olds are selected for further study. At each age this is somewhat less than predicted from the performance of the normative sample. The few cases from Classes VI and VII in the lower socio-economic group may partially account for this.

Among the children given the screening test by the speech correction teachers, were nearly 500 in one city who were tested during the summer round-up program. Unfortunately, a well-defined sample in terms of socio-economic level could not be drawn from this group since fathers' occupations were not precisely stated. Nevertheless, samples of children ranging within three months of four-and-a-half and five years were drawn: 132 four-and-a-half-year-olds, and 135 five-year-olds.

The mean scores for the two groups are 35.3 and 44.2; and the medians are 47 and 48, respectively. These are higher than the same measures for the normative sample at the same ages. Using the cut-off scores with this sample, only 7.4 per cent of the five-year-olds, and 6.1 per cent of the four-and-a-half-year-olds would have been selected for further study. This is considerably fewer than predicted. This discrepancy may be due to differences in the standards of the testers or to differences in performance related to the characteristics of the samples. The relations between accuracy of articulation and socio-economic status of fathers has been established. It is probable that this sample is skewed toward the upper socio-economic levels. Since fathers' occupations could not be classified, this assumption cannot be verified. It is made, however, because it is unlikely that many unskilled workers would be affiliated with specific organizations and such established companies as were mentioned on nearly every blank.

Summary

The 50-item screening test of articulation published in 1947 was given to a representative sample of 480 subjects, 60 at 3, 3½, 4, 4½, 5, 6, 7, and 8 years of age. Further study of the screening test has continued to show it to be a sensitive measure.

1. The correlations between the screening test and various outside criteria are similar to those between the diagnostic test and the same criteria.

2. The correlations between the screening and the diagnostic tests are .94 and above for single age levels.

3. The comparison by age, socio-economic status and sex on the screening test are in essential agreement with those made on the diagnostic test.

4. For each age level cutting scores on the screening test are suggested for the detection of probable articulatory defectives.

References

1. AMMONS, R. B. AND AMMONS, H. S. *The Full-range Picture Vocabulary Test.* New Orleans: Author, 1948.
2. CRONBACH, L. J. *Essentials of Psychological Testing.* New York: Harper, 1949.
3. DAVIS, E. A. *The Development of Linguistic Skill in Twins, Singletons with Siblings, and Only Children from Age Five to Ten Years.* (Univ. of Minn. Instit. of Child Welfare Monogr. Ser. No. 14) Minneapolis: Univ. Minn. Press, 1937.
4. *Minnesota Scale for Parental Occupations.* Minneapolis: Institute of Child Welfare, Univ. Minn., 1950.
5. POOLE, I. The genetic development of articulation of consonant sounds in children's speech. Ph.D. Dissertation, Univ. Mich., 1934.
6. ROE, V. AND MILISEN, R. The effect of maturation upon articulation in elementary grades. *JSD,* 7, 1942, 37-50.
7. TEMPLIN, M. C. The development and interrelation of certain language skills in children. (In preparation for publication.)
8. ———. A non-diagnostic test of articulation. *JSD,* 12, 1947, 392-396.
9. White House Conference on Child Health and Protection. *Special Education, The Handicapped and the Gifted.* New York: Century, 1931.

The Relationship Between Articulation And Other Developmental Factors In Children

Rodney W. Everhart

IT IS IMPOSSIBLE to confine the maturation of articulation to one single factor of growth and development. Rather, the development of articulatory patterns within the normal range is dependent upon the degree to which each aspect of growth and development operates in the individuation of speech out of the psychophysical systems possessed by the individual.

A cursory reading of available research reports indicates that a systematic knowledge of articulatory defectiveness in relation to various factors of growth and development has not yet been achieved. The work done thus far tends to be spotty, meager and in many instances unscientific. A number of studies, however, reveal a possible relationship between the incidence of defective articulation and such factors as intelligence, retarded physical development, sex differences, and occupational class differences. These studies tend to establish the thesis that certain intrinsic and extrinsic influences could impose individual deviations in sequence, rate, and pattern of growth and development, which might contribute to the occurrence of defective articulation.

According to Spiker and Irwin (*8*), there appears to be a small but reliable relationship between certain aspects of infant speech sound maturation and the abilities measured by the Kuhlmann Test of Mental Development. Hall (*4*) found in her study involving both college and elementary school students that memory span for speech sounds was significantly correlated with intelligence.

A positive parallel between retarded physical growth and development and speech handicaps has been reported by Beckey (*1*), Mead (*5*), and Van Riper (*9*). These investigations indicate that children with delayed speech maturation tend to be slower in dental, physical, and coordinated development. It should be pointed out, however, that these studies were not undertaken exclusively with articulatory handicapped children. Rather, they were conducted with all types of speech defective pupils.

Beckey (*1*), Gesell and Lord (*2*), and Smith (7) found a high correlation between occupational class, a factor contributing to socio-economic status, and speech retardation in the child. Here again, consideration was

Rodney W. Everhart (Ph.D., Michigan, 1953) is Assistant Professor of Special Education, East Carolina College. This article is adapted from a portion of a doctoral dissertation completed under the direction of Dean Willard C. Olson.

given to speech defectiveness in general, and not specifically to articulatory handicapped children.

The present investigation was undertaken to study the importance of various growth and developmental factors in the maturation of speech articulation for elementary children in grades one through six. More specifically, the research was concerned with the relationship of physical, mental, and environmental variables to elementary children with and without defective articulation. Relative to the physical conditions of the children, such factors as onset of holding head up, onset of sitting alone, onset of crawling, onset of walking, onset of talking, onset of voluntary control of bladder, eruption of first tooth, handedness, grip, height, and weight were analyzed.

From the mental view point, the following factors were studied to determine their possible effect upon the maturation of articulation: intelligence, reading and arithmetic.

Paternal occupation was used as an index of broad environmental or socio-economic differences.

Procedure

Three weeks were spent in conducting a thorough speech survey in the Willow Run, Michigan, Public Schools in order to determine the total number of elementary children possessing defects of articulation enrolled in grades one through six. This was accomplished by utilizing a quick test of spontaneous and directed speech. The test consisted of special sentences constructed to include several examples of all the consonant sounds where possible in the initial, medial, and final positions for the child with reading skill. An assortment of pictures selected so that their names contained the consonant sounds to be tested were used for the child whose reading was faulty. It further consisted of observing the pupil's connected and continuous speech during a brief conversation. Deviations ordinarily found in the articulatory patterns of normal speaking individuals, and those attributable to dialect were not considered. Only speech errors that could be broadly classified under the categories of substitution, omission, and distortion were regarded as handicaps of articulation. A child was diagnosed as possessing an articulatory defect if he or she displayed a deviation in one or more of the consonant sounds in any of the three positions. The results of the testing revealed that 110 elementary children could be classified as having articulatory disorders.

Step two in the procedure consisted of selecting a cross-sectional sample of elementary children producing consonants within the normal range from the total number of pupils (grades one through six) enrolled in the Willow Run Schools, and matching them according to the criteria of sex, grade, and race. This group contained the entire number of pupils remaining after the segregation of children possessing disorders of articulation. A cross-sectional sampling was secured by dividing the complete number of students enrolled in grades one through six into four groups, namely, white boys, white girls, Negro boys, and Negro girls, according to their grade level. The total number of pupils were subsequently recorded alphabetically on a list according to the classification mentioned above. It then became necessary to determine a ratio, based upon the number of students classified in a given group to the number of pupils similarly classi-

fied in the articulatory handicapped sample. This was accomplished by going through the four alphabetical lists and selecting children according to the interval set by the ratio determined for each group. As a result of this procedure, 110 elementary children possessing articulatory patterns within the normal range were selected to be compared with the 110 elementary children having defective articulation.

A mental age, reading age, and arithmetic age were obtained by administering the California Short-Form Test of Mental Maturity (Primary, and Elementary, 1950 S-Forms), the Gates Reading Test (Primary, Advanced, and Basic), and the Iowa Every-Pupil Test of Basic Skills, Test D: Basic Arithmetic Skills–Form O (Elementary, and Advanced Batteries).

Grip was obtained by the use of the Smedley dynamometer. Height and weight were secured from each pupil's permanent school record. These measurements were converted into grip age, height age and weight age by using the manual for conversion prepared by Olson and Hughes (*6*).

The remaining data encompassing various physical factors of growth and development in months, and paternal occupation were abstracted from a mimeographed questionnaire sent home with each elementary child included in the previously mentioned samples. In general, these case history questionnaires were filled out by the parents or near relative of the pupil. Paternal occupations obtained from this questionnaire were classified on the basis of a scale drawn up by Goodenough and Anderson (*3*).

Results

The *t*-distribution of the difference between means was used to test this major null hypothesis: There is no significant relationship between the various physical growth and developmental factors studied and the incidence of defective articulation. This hypothesis was established on the premise that elementary children with and without articulatory handicaps experience certain stages of physical growth and development at the same average age. Further, this hypothesis was based upon the assumption that the differences observed in the average age at which these stages of growth and development are experienced in the two groups is due to chance, and is not associated with articulatory difficulties.

The general test of independence or lack of relationship between selected growth and developmental factors and the occurrence of defective articulation was contingent upon these specific null hypotheses which were tested: There is no significant relationship between the incidence of articulatory defectiveness and: 1. onset of holding head up; 2. onset of sitting alone; 3. onset of crawling; 4. onset of walking; 5. onset of talking; 6. onset of voluntary control of bladder; and 7. eruption of the first tooth.

There were no significant physical differences noted for elementary boys and girls with and without articulatory defects with regard to the variables listed above. Low significance levels of 5% and 10% were found for onset of sitting alone and onset of holding head up in the case of boys with and without defective articulation. These findings tend to suggest a possible relationship between defective articulation and these fac-

tors. From a statistical point of view, however, the results are not definite enough to conclude that significant differences have been demonstrated.

Mean differences for both sexes in relation to the physical factors studied were all quite small, the largest being 1.7 months.

The chi-square statistical technique was used to compare the relationships of several growth and developmental factors to chronological age in elementary children with and without articulatory deviations, and to test the significance of the differences in the relationships observed. The method utilized in order to apply this technique was to plot the factors of mental age, reading age, arithmetic age, grip age, height age, and weight age against chronological age.

It is felt that the chi-square statistical technique best fulfilled the requirements for a precise and accurate appraisal of the data analyzed. The *t*-test, and certain correlation or regression techniques to test the difference between slope and level in two samples could have been employed to differentiate between the variates studied. These techniques are somewhat more difficult to calculate and generally do not render a better analysis of the data. Where a significance level of 20% or below was found after the application of the chi-square technique, however, the writer applied the *t*-test in order to check further the reliability of the results. In a few instances, significance levels of 20% or below were apparent. The *t*-test was applied in order to check the data obtained from chi-square with the result that no appreciable differences in significance levels were discovered.

The following null hypotheses were tested with the chi-square statistical technique: There is no significant relationship between articulatory defectiveness and: 1. grip; 2. height; 3. weight; 4. handedness; 5. intelligence; 6. reading; 7. arithmetic; and 8. paternal occupation.

Data secured from the application of the chi-square technique for grip, height, weight, reading, arithmetic, handedness, and paternal occupation revealed no significant differences between elementary boys and girls with and without articulatory handicaps.

The significance levels obtained from the calculated values of chi-square for grip and handedness were 18% and 9%, in elementary boys with and without disorders of dyslalia. A significance level of 8% was reported for elementary girls with and without articulatory handicaps for handedness. These findings are indicative of the fact that some doubt can be cast upon the specific null hypotheses denoting no association between grip, handedness, and articulatory deviations. Possibly larger sample sizes would have resulted in significant differences.

It was also worthy of note that the means for grip age, height age, and weight age in the case of elementary boys and girls with and without articulatory errors were all fairly comparable.

An analysis of the data pertaining to reading ability for the two samples of elementary boys studied provided no grounds for definite rejection of the null hypothesis involved. It should be mentioned, however, that the established significance level of 1.5% tends to shed considerable doubt upon the null hypothesis, even though it is not sufficient enough to reject it statistically. The observed frequencies for boys having normal articulation were higher than the expected fre-

quencies in the upper norm ranges, and the observed frequency was lower than the expected frequency in the norm range less than 0.90. In the case of boys with articulatory defects this finding was reversed. This is evidence that if larger sample sizes had been available, a significant relationship might have been observed between reading and the occurrence of inferior articulation. Also, larger sample sizes might reveal a tendency for boys with normal articulation to have higher reading ages than boys possessing articulatory difficulties.

Elementary boys and girls with normal articulation definitely occupied the higher norm ranges for intelligence when compared with elementary boys and girls possessing disorders of dyslalia. The mathematics of chi-square established significance levels of 0.1% for boys and girls compared separately with and without defective patterns of articulation. Therefore, it can be assumed that these low significance levels make it necessary to reject the original null hypotheses and conclude that real differences in intelligence appear to exist in favor of children with normal articulation, when compared with pupils having articulatory defects.

Discussion

The interpretation of results presented in this study suggest certain limitations. At the same time, there are many justifications for the procedures followed in this investigation.

The speech correction questionnaire utilized in this study was devised for the purpose of tapping the parent's fund of information, in order to explore various factors of growth and development in a given child. An attempt was made to phrase the questions in such a manner that the influence of suggestion would not prejudice the answer. The writer is aware that the method possesses certain fundamental limitations with respect to the size and representative character of the sample, and the inaccuracy of report. After consideration was given the limitations and desirable qualities of this particular method of survey, however, the conclusion was reached that the questionnaire was the only feasible and practical way in which to collect the desired information.

A second limitation is the restriction of the investigation to grades one through six. While this restriction could tend to magnify the possible selective factors involved in the final interpretation, it was deemed necessary on the basis of available time, accessible children, and the unique problems involved in securing the cooperation of the necessary personnel within the school system. It was not felt that this delimitation would detract appreciably from the validity of the investigation, if the resulting sample corresponded to those of the whole group.

It is altogether possible that certain results of this study may have psychological significance. This investigation was not essentially a psychological study. No effort was made to ascertain or interpret the relevancy of any existing psychological implications to the various factors of growth and development considered. On the contrary, the main purpose was to compare elementary children exhibiting defects of articulation with elementary children producing consonants within the normal range, in order to determine the importance of various growth and developmental factors in the maturation of acceptable patterns of speech articulation.

Another limitation that should be

pointed out was that the group type of tests used in this investigation did not necessarily provide an opportunity to study the examinee from an individual point of view, so that his oral responses might be thoroughly analyzed. Also there was the possibility that the national norms established for the group tests previously mentioned were not indicative of the actual existing situation, when applied to a population composed of the product of in-migration. These facts could tend to detract from the validity of the group tests administered. The economy of time and certain administrative and personnel involvements necessitated the use of the group tests, however, rather than individual ones.

Finally, there must be acknowledged the fundamental weaknesses involved in the cross-sectional method of survey. The method admittedly tells little about individuality of growth or change with time in a given child, but it does provide an economical and reasonably rapid means of collecting data without extraordinary investments of time and money.

There are doubtless many other questions related to the role of various growth and developmental factors to the maturation of articulation, investigation of which would be of much value in enriching the present store of knowledge about their influence in effecting the satisfactory development of articulatory patterns of speech.

As this investigation has indicated, a number of growth and developmental factors might be operating successively or simultaneously to interfere with the maturation of acceptable patterns of speech articulation in children. Therefore, the problem in the future is not to isolate the one or two elements causing defective articulation, but to find what factors of growth and development considered collectively could contribute to the retardation of articulatory development.

Summary

The main purpose of the present study was to determine the importance of various growth and developmental factors in the maturation of speech articulation for elementary children in grades one through six. The particular growth and developmental factors chosen for study in relation to defective articulation were: onset of holding head up, onset of sitting alone, onset of crawling, onset of walking, onset of talking, onset of voluntary control of bladder, eruption of first tooth, handedness, grip, height, weight, intelligence, reading, arithmetic, and paternal occupation.

A clinical analysis of 110 elementary children having articulatory deviations was made and evaluated statistically. A corresponding study of 110 elementary children possessing articulatory patterns within the normal range was made to determine what factors were common to the two groups and what factors differentiated them. These two groups were compared by utilizing the *t*-distribution of the difference between means and the chi-square statistical technique, in order to determine whether or not significant differences existed.

In accordance with experimental findings, the following conclusions become apparent.

There are no significant differences for elementary children with and without articulatory defects in respect to onset of holding head up,

onset of crawling, onset of sitting alone, onset of walking, onset of talking, onset of voluntary control of the bladder, eruption of first tooth, grip, height, weight, and handedness.

On the basis of the evidence presented in this report it is reasonable to conclude that a positive correlation exists between the factor of low intelligence and the incidence of articulatory disorders. This no doubt can be attributed to the fact that a child possessing a good intellectual capacity has superior powers of critical observation, of seeing relations, and of grasping meanings, which could assist the natural and unfolding design of his articulatory growth and development. The question may well be raised, however, as to whether a child's maturation of acceptable patterns of articulation are a result of his superior intelligence, or whether, the latter is caused by his superior articulatory development. The findings of this investigation do not render a valid basis for making a definite conclusion in this respect.

The factor of paternal occupation is not related to the occurrence of articulatory deviations. This conclusion does not uphold previous findings in the literature. Possibly this can be attributed to the fact that the data studied for this particular factor was obtained from a fairly homogeneous group of in-migrants from the southern part of the country. Additional experimental verification is indicated with a comparable group.

References

1. Beckey, R. E. A study of certain factors related to retardation of speech. *JSD*, 7, 1942, 223-249.
2. Gesell, A. and Lord, A. E. A psychological comparison of nursery school children from low and high economic status. *Pedagog. Sem.*, 34, 1927, 339-356.
3. Goodenough, F. L. and Anderson, J. E. The Minnesota Scale for Paternal Occupations. *In: Experimental Child Study*. New York: Century, 1931.
4. Hall, M. Auditory factors in functional articulatory speech defects. *J. exp. Educ.*, 7, 1938, 110-132.
5. Mead, C. D. The age of walking and talking in relation to general intelligence. *Pedagog. Sem.*, 20, 1913, 460-484.
6. Olson, W. C. and Hughes, B. O. *Manual for the Description of Growth in Age Units*. Ann Arbor: Univ. of Mich., 1950.
7. Smith, M. E. A study of some factors influencing the development of the sentence in preschool children. *J. genet. Psychol.*, 46, 1936, 182-212.
8. Spiker, C. C. and Irwin, O. C. The relationship between IQ and indices of infant speech sound development. *JSHD*, 14, 1949, 335-343.
9. Van Riper, C. Persistence of baby-talk among children and adults. *Elem. Sch. J.*, 38, 1938, 672-675.

Speech Examination Of A Group Of Institutionalized Mentally Handicapped Children

Bernard B. Schlanger

THE STUDY of the speech of a group of mentally handicapped children is worthwhile when one considers the size of the population (7, *14*), the need for knowledge in this area (*18*), and the fruitfulness of the findings in a group in which more than 50 per cent are usually speech defective (*8, 12, 21, 28*). In studying these submarginal groups much can be learned concerning the limitations in normal organic and social development. Further, such study enables the speech pathologist to deal more adequately with those mentally handicapped children who are brought to him for speech diagnosis and possible therapy.

Problem

This exploratory study of the speech of a segment of the population designated as mentally handicapped aims to (1) measure certain factors typically reported in the literature of speech pathology as determinants of articulatory skill, and (2) determine the present level of speech skill as represented by articulatory proficiency.

Without reference to possible etiology, it was decided to subject these factors to statistical analysis in the hope of revealing the significant interrelationships that enter into the heterogeneous character of the speech picture presented by a group of institutionalized mentally handicapped children. Viewing this research as an educational problem, precise medical diagnosis was not needed. Indeed, the application of a medical label to an abnormal child might evoke certain stereotypes affecting the judgment of the observer, and set up a chain reaction of prejudgments on the basis of the labeled origin or cause. Nevertheless, it is perhaps pertinent to observe that so far as the present group of subjects is concerned, there was little evidence of progressive pathology in most of the subjects.

Limitations

It is important that certain limitations of the present study be pointed out. First, the subject population is not representative of the entire range of mental retardation. While the children are spoken of as a group, implying that both the problems and individuals are homogeneous, no such implication is intended. For this brief discussion it proves the only workable frame of reference. The subjects of this investigation are of a higher socio-economic stratum of society than the usual institutionalized mental defective pop-

Bernard B. Schlanger (Ph.D., Wisconsin, 1952) is Speech Pathologist at The Training School, Vineland, N. J. This article is based on a portion of a doctoral dissertation completed under the direction of Professor John V. Irwin.

ulation; they are enrolled in a private training institution; they represent the trainable and educable population of the school; they have speech. Finally, the concept of speech employed throughout this study constitutes in itself another limitation. West's (*30*) definition of speech as 'audible language, particularly that which is conventionalized into an arbitrary code, in contra-indication to emotional cries' has been accepted here. Since the main concern here is with the 'vehicle' of language rather than thought and functional analysis of language, the term speech will exclude the end product, the communication of ideas and feelings.

Subjects

Seventy-four children enrolled in St. Coletta's School for Exceptional Children, Jefferson, Wisconsin, (a) who fell between the chronological ages of eight and 16 years, and (b) whose intelligence quotients, based on the Revised Stanford-Binet, Forms L or M, were 40 or above, were included in the testing program. The mean C.A. was 12 years, 1 month; the mean M.A. was 6 years, 8 months.

Table 1 presents the speech symptom picture. All subjects were able to communicate orally. On the basis of a speech rating by three qualified judges, however, 68 per cent of the children

TABLE 1. Distribution of speech defects among the subjects using symptomatic classification.

Speech defect	*Girls*	*Boys*	*Total**	*Per cent of subjects*
1. Stuttering	5	10	15	20.3
2. Articulation	14	28	42	56.7
Infantile perseveration	2	6	8	
Lalling	3	2	5	
Delayed speech	0	0	0	
Oral inaccuracy	9	20	29	
3. Voice	17	29	46	62.1
Monotone	4	9	13	
Husky-hoarse	13	14	27	
Breathy	5	6	11	
Thin (weak)	5	3	8	
Denasal	4	3	7	
Nasal	0	1	1	
Strident	0	4	4	
High pitch	1	2	3	
Monopitch	4	5	9	
Scanning	1	4	5	
4. Cleft palate speech		1	1	1.4
5. Cerebral palsied speech		4	4	5.4
Spastic		3	3	
Ataxic		1	1	

*Some subjects have more than one defect of speech.

were considered speech defective. The percentage of speech defective children compares roughly with reported surveys of the speech of mentally retarded children (*8, 12, 21, 28*).

Tests and Results

A series of tests of presumed importance in speech evaluation procedures selected from the literature, composed the test battery, as reported below.[1]

Pure-tone Audiometric Test. A pure-tone audiometer, Maico portable, Model F-1, was used for hearing testing. Precautions, similar to those described by Birch and Matthews (*4*), were taken.

The binaural loss of hearing for speech was computed on the basis of the formula recommended by AMA (*29*). This loss subtracted from 100 per cent gave the per cent hearing used in the statistical calculations. An AMA per cent hearing evaluation under 96 per cent but no lower than 90 per cent was defined as a 'slight' loss; less than 90 per cent but no lower than 55 per cent, a 'moderately severe' loss; an evaluation below 55 per cent was defined as a 'severe' loss.

Hearing loss was indicated in approximately 30 per cent of the total group. Fourteen per cent are included in the 'moderately severe' and 'severe' categories. Both of these percentages exceed Silverman's estimate (*5*) that about five per cent of normal school children between the ages of five and 17 are defective in hearing. Birch and Matthews (*4*) also found a larger percentage of hearing loss among institutionalized mental defectives.

The hearing of some of the subjects in this study may deteriorate. Even a slight hearing difficulty can affect the child during his period of learning and development of speech with a resultant effect on estimates of the child's intelligence. It may also suggest that a language handicap will be suffered which may in turn influence the results of intelligence tests.

Above an M.A. of 7 years, few difficulties were encountered in the testing situation. Between the M.A.'s of four and five, results were satisfactory in two out of three cases. This agrees with Birch and Matthews (*4*).

From case history data it was found that only three of the subjects were recognized by the parents or doctors as having hearing losses. This is an indication of the incompleteness of such case history material and points up the need for careful clinical testing of the hearing of the mentally retarded child.

Auditory Memory Span for Vowels. One of the factors presumed basic to the acquisition of speech is the auditory memory span of the individual (*1, 15, 30*). Delay in the ability to organize sounds in temporal sequence may impede the speech development of the child.

During the testing the subject sat with his back to examiner at a distance of two feet. Vowel sounds were read in a monopitch slightly louder than ordinary conversational tone. There was a one-second interval between sounds. Trials were made first with one vowel. At each success another was added. Three trials were given for each group of different vowels. The

[1] In addition to the tests to be reported on in this article, the following were also included (*19*): Speech proficiency rating by three judges; Four word-count measures of spontaneous speech—mean sentence length, type-token ratio, number of words per minute, number of sentences more than one word in length; Strauss-Kephart Behavior Diagnostic Scale; Weighted Environmental score; Revised Stanford-Binet, Forms L and M.

sequence was considered passed when one of the three trials was repeated without error.

The mean score achieved by the group was 3.08 with a standard deviation of .88. Two independent studies reporting on the auditory memory span for children may be used for comparison. These studies are by Métraux (*15*) and Beebe (*2*). The former, however, used a weighted method of scoring while the latter tested memory span for meaningless syllables. The scoring system used by the writer gives a higher value than does that used by Métraux which utilizes a basal score and added credits. Nevertheless, her subjects with a C.A. of six achieved a weighted vowel mean of 3.07. The subjects of this study with a mean C.A. of twelve years, one month, attained a vowel mean of 3.08. As this ability increases with age, it is obvious that her subjects were far superior in this measure. The same sort of reasoning may be applied to Beebe's study. Her groups at C.A.'s six and seven scored a mean of 4.3 in repeating nonsense syllables. Assuming that nonsense syllables are more difficult to reproduce than vowels, nevertheless, her five age groups with a lower C.A. of four attained higher mean scores than the mentally retarded group of this study.

Previous experiments testing the auditory memory span for vowels concluded that when the scores are compared with measures of intelligence, the correlations tend to run low (*1, 2, 15*). A different result was obtained in this study as will be shown when intercorrelations between all the measures are discussed. It is when the normal is compared with the subnormal, or the latter with each other that wide differences become apparent. The children in the Beebe and Métraux studies had average intelligence. The mental ages of these groups were at the same level as that of the mentally handicapped group with its mean M. A. of six years, eight months. Viewed in this light, the superiority of the normal children to the group in this study in the performance of the auditory memory span test becomes even more apparent.

Sound Discrimination. The ability to discriminate among speech sounds is important in the learning of speech (*27, 30*).

The Templin Short Test of Sound Discrimination (*25*) was used. As some of the children were unable to write, each was given an individual test to which he replied orally. The examiner's lips were covered with a sheet of paper during the production of the sounds. A short practise session preceded the actual testing in which the concepts of 'same' and 'not the same' were illustrated with concrete materials. Next, obviously different paired sounds were illustrated with the examiner's lips uncovered. Following this, practise samples were utilized.

After the reading of the first column of 10 pairs of sounds, errors in the responses were pointed out, and the test was continued. If perseveration on the same response continued, phonetic units distinctly different were inserted to check on the S's grasp of the test. If it were obvious that the concept had not registered at that period, the test was halted. Another opportunity was given at a later date to those who had been unable to understand the directions. In every instance, those who failed to respond adequately on the first test, failed the re-test.

The mean number of errors scored by the group is 39.9. Twenty-three of the subjects were unable to grasp

the idea of the test despite intensive orientation on two occasions. The M.A.'s of the children unable to grasp the procedure ranged from four years, one month, to six years, nine months. Norms are given by Van Riper (*27*) for various grades. The lowest grade given is Grade Two. The mean number of errors obtained from averaging the scores of children in this grade came to 14.2. A comparison of this score with that of the present subjects indicates their marked deficiency in the area of sound discrimination. Only 14 (19 per cent) of the subjects were able to achieve a score approximating the norm for Grade Two.

It may be said that the mentally handicapped children of this study seem to show functional difficulty with the finer distinctions between sounds. Further, when the M.A. is below six years, and the I.Q. is 50 or lower, the mentally deficient children tested cannot grasp the directions needed to undertake this sound discrimination test. Although no attempt was made to differentiate between the children on the basis of brain-injury, there is some agreement between the results of the children positively diagnosed as brain-damaged and the observation of Strauss and Lehtinen (*23*) that these children display a weakness or disturbance of auditory perception unrelated to hearing acuity.

Diadochokinesis. One of the factors concerned with the development of articulation is the speed of repeated muscle movement (*30*). In recent experimentations at the University of Wisconsin, the Sylrater (*10*), has been used to measure maximum repetitive movements.

Using the procedure established by Irwin and Becklund (*10*), the maximum repetitive speed for each of three syllables [pʌ tʌ kʌ] and maximum repetitive speed for tapping with the right, left and both hands were recorded.

In almost all cases, [pʌ] proved to be the sound produced at the greatest speed. In every case, either the right or left hands exceeded the tapping rate of both hands tapping simultaneously.

The mean scores of the group for maximum rates of syllable repetition and better hand tapping were, respectively, 4.22 and 4.03. Norms at C.A. seven, nine and eleven for [pʌ] and tapping with the preferred hand (*10*) were compared with the results obtained with the present group. As the norms were established separately for girls and boys, the mentally handicapped group was divided on the basis of sex for this comparison.

The *t*-test of the significance of the difference between the means was applied at each of the age levels to attempt to establish (1) the statistical significance of any difference and (2) at what age level these differences were most marked.

These comparisons indicate that the performance of the mentally deficient boys whose mean C.A. is twelve years, one month with a range from eight years to sixteen years is approximately that of the seven-year-old normal group. Statistically significant differences were found between these boys and the nine- and eleven-year-old normal boys in both tapping and syllable rates. So far as the girls are concerned, only the means of the eleven-year-old normal group are superior in both Sylrater measurements. The tapping rate shows a difference significant at the one per cent level; the syllable repetition shows a difference significant at the five per cent level. The subnormal girls' C.A. mean and range were approximately the same as

that of the retarded boys. It may be concluded from these results that, insofar as both the maximum repetitive speed for [pʌ] and preferred hand tapping measure a type of motor skill, the retarded boys and girls are significantly inferior in their motor responses.

An interesting sidelight concerning the tapping rate is that 18 (24 per cent) of the retarded children attained higher tapping scores with their left hands than with their right; six scored the same with both hands. It may be argued that the hand which is able to obtain the highest score in rapid repetitive movement is the preferred hand. If this assumption, which needs further verfiication, is correct, then only 68 per cent of the mentally handicapped group exhibit right-handedness. It is interesting to compare this figure with Hildreth's summarization (*9*) of studies of the handedness of school children in which 93 per cent are right handed. The greater incidence of left-handedness among mental defectives is borne out in several studies cited by the above. One of these, a study by Mintz, found left-handedness in 25 per cent of 97 subjects whose M.A. and C.A. ranges closely match those of this study. If, as was stated above, the relative tapping rates of the two hands adequately measure handedness, the amount of left-handedness is identical for both Mintz' group and the present group. This greater incidence of left handedness among mentally retarded children may be attributed to the fact that they are less responsive to social training; they receive less of it, and they do not learn so easily from incidental clues (*9*). Some of it may be the result of damage to specific areas of the brain.

Articulation Testing. The subjects were tested in five speech activities. The consonants were checked in all positions. The method used in quantifying the subject's ability to articulate consonant sounds correctly was the 'articulatory index' described by Wood (*31*).

The following tests and methods of presentation were used:

1. Repeated isolated sounds. The consonant sounds were presented in the developmental sequence established by Poole (*17*).

2. Repeated isolated words. The words presented by the examiner contained sounds in the same sequence as in the preceding test (*11*).

3. Spontaneous words based on picture stimuli. Bryngleson-Glaspey picture cards were used to elicit spontaneous words. In order to equate the preceding tests of repeated consonants and this test, five additional pictures were added.

4. Memorized selections, repeated phrases and sentences. This test was recorded on tape, and consisted of the prayers 'Hail Mary' and 'Sign of the Cross,' which were memorized by the children, and social phrases and simple sentences repeated after the examiner.

5. Spontaneous non-emotional conversation. This test consisted of (a) tape recorded descriptions and stories based on stereoptican pictures seen through a View-Master,[2] (b) conversation adapted to the happenings of the recent Christmas vacation, and (c) descriptions and comments of the subjects pertaining to activities

[2]The View-Master and the three dimensional Kodachrome reels consisting of seven still frames are manufactured by Sawyer's, Portland, Ore. The reels used consisted of FT-5, 'Cinderella and the Glass Slipper'; FT-4, 'Snow White and the Seven Dwarfs'; and XM-2, 'The Christmas Story, Part II, The Shepherds.'

TABLE 2. Articulatory index measures of five types of speech activity.*

Tests	*Mean Scores* *Boys (N=48)*	*Girls (N=26)*	*Total (N=74)*	*S.D.*
I. Repeated isolated sounds	84.96	87.45	85.83	14.75
II. Repeated isolated words	86.02	85.79	85.94	14.37
III. Spontaneous words from picture stimuli	87.34	89.36	88.05	11.58
IV. Memorized prayers, repeated phrases and sentences	80.29	82.48	81.06	12.12
V. Spontaneous non-emotional conversation	79.22	84.47	81.06	11.39
All tests	83.46	85.91	84.39	11.80

*Consonants in all positions.

connected with a doll house and the placement of furniture therein.

Table 2 presents the results of the testing of the consonant sounds in all normal positions in five types of speech activity. The articulation indices represent the percentage of correct responses and are based on a perfect score of 100. Both boys and girls made their highest mean scores in Test III, spontaneous speech based on picture stimulus cards. Lowest mean scores by both sex groups were made in Tests IV and V which measured continuous speech. The scores on Tests I and II were almost identical, as were those of Tests IV and V. In all tests except Test II the mean scores of the girls were higher.

The differences in the means obtained on the five tests by the total group were subjected to the *t*-test. The differences between both the means of Tests IV and V and the mean of Test III are significant at the one per cent level. The differences between both the means of Tests I and II, and Tests IV and V are significant at the five per cent level. The differences, then, between the means of Tests IV and V, which are concerned with continuous speech, and

TABLE 3. Number and type of articulatory errors made in five types of speech activity*.

Tests	*Types of Errors* *Substitutions*	*Distortions*	*Omissions*	*Total errors*
Repeated isolated sounds	404	318	64	786
Repeated isolated words	519	265	114	898
Spontaneous words from picture stimuli	575	109	113	797
Memorized prayers, repeated phrases, and sentences	444	131	265	840
Spontaneous non-emotional conversation	718	119	140	977
Total	2,660	942	696	4,298
Per cent errors	10.3	3.6	2.7	16.6

*Total number of sounds tested—25,900.

TABLE 4. Matrix of Pearson product-moment zero-order coefficients of correlations.

	M.A.	*C.A.*	*Artic. Index*	*Repeating [pa]*	*Tapping Better Hand*	*Auditory Memory for Vowels*	*Sound Discrimination*	*AMA Per Cent Hearing*
M.A.		.64**	.37**	.21	.31**	.25*	.71**	.03
C.A.			.30*	−.13	.07	.07	.38**	–
Artic. Index				.18	.08	.13	.37**	.28*
Repeating [pa]					.61**	.14	.28*	–
Tapping Better Hand						.01	.23*	–
Auditory Memory for Vowels							.27*	.00
Sound Discrimination								.11
AMA Per Cent Hearing								

*Significant at 5 per cent level.
**Significant at 1 per cent level.

Tests I, II and III, which are concerned with isolated sounds and words, are all statistically significant at less than the five per cent level. This indicates that so far as these mentally retarded children are concerned, a different picture of their useful articulation is given by tests of conversation or continuous speech than by tests of isolated sounds or words.[3]

The difference in the means of Tests II and III are significant at the 32 per cent level. This finding is in harmony with Templin's study (*24*) in which spontaneous and imitative reproduction of words were used in measuring the articulation of normal children.

A tabulation of types of errors made by the subjects is found in Table 3. It is of interest to note that the greatest number of errors were substitutions. These accounted for more than 10 per cent of the total number of sounds tested. In this group of children approximately 16 per cent of the articulated speech deviates sufficiently from the accepted normal speech of other children that it calls attention to itself, interferes with communication, and may be one of the factors causing its possessor to be maladjusted.

[3]This substantiates conclusions by Spriestersbach and Curtis (*22*) concerning the need for detailed testing of any defective sound in all phonetic contexts.

Interrelationships of the Variables

One of the purposes of this investigation was to find the interrelationships in this group among certain variables presumed to influence articulatory development. The extent of the linear relationships between pairs of these variables was determined by product-moment coefficients of correlation. These are found in Table 4.

M.A. and Other Factors. Product-moment correlations were obtained between M.A. and seven other measures. Coefficients of correlation significantly different from zero at the one per cent level were obtained between M.A. and three of these measures: the 'articulatory index,' sound discrimination, and hand tapping rate. Coefficient correlations between M.A. and auditory memory for vowels is significant at the five per cent level while the r between M.A. and syllable repetition speed is .21 which closely

approximates significance. The r between M.A. and hearing is .03.[4]

C.A. and Other Factors. Product-moment correlations between C.A. and the other measures showed sound discrimination and M.A. significantly different from zero at the one per cent level, the 'articulatory index' at the five per cent level and no significant r between the remaining measures and C.A.

Relative Influence of C.A. and M.A. In every instance the coefficients of correlation between M.A. and the measures used were higher than those between C.A. and the comparable scores. The use of the partial correlation technique to ascertain the relative influence of M.A. and C.A. on the measures presumed related to the development of articulation and speech proficiency as measured by the 'articulation index' indicates that in every instance in which M.A. is held constant, the coefficients of partial correlation between C.A. and the variables used decrease markedly. On the other hand, when C.A. is held constant, coefficients of partial correlation between M.A. and the variables increase with the exception of sound discrimination and the articulatory index. The decrease in the latter two is slight, however, and does not approach the lowering of the partial coefficients of correlation when M.A. is held constant.

From these data, and cognizant of the fact that the partial correlations tell nothing about the nature of the cause-and-effect connections between the variables of this study (*13*), it is possible to suggest that (a) the retardation, or developmental arrest, demonstrated in the scores obtained by these children may in part cause the low M.A.'s as obtained by the revised Stanford-Binet; (b) the scores are in part caused by the M.A.; (c) each is in part caused by the other; or that (d) a biological defect operative in most of the children affects the scores obtained by them on both the Stanford-Binet and the other measures used in this study.

Interrelationships Among Remaining Measures. The interrelationships among the five measures presumed to affect articulatory development indicate that these measures are not related to a highly significant degree with the exception of the maximum repetitive rate for [pʌ] and hand tapping. Their correlation of .61 indicates that these two functions are measuring some generalized ability in these children to execute rapid movement. Sound discrimination is related significantly at the five per cent level with the above two diadochokinetic measures and the auditory memory span for vowels. No measure among this group of tests is significantly related to the AMA hearing scores.

Summary

This study was designed to explore the articulation of a group of mentally deficient children. The basic goals of the study were to measure five determinants of articulatory skill, and to test their articulatory proficiency. Further goals were to investigate the interrelationships between these speech developmental factors, articulatory proficiency, C.A. and M.A., and to consider the relative influence of M.A. and C.A. on these measures.

Major findings were: (1) Thirty

[4]Three of the measures having highly significant r's with M.A.—sound discrimination (.71), and two measures not reported on in this article, mean length of sentence (.63) and number of words per minute (.56)—are also significantly correlated with each other and with more than half of the original 98 correlations obtained (*19*).

per cent of these children exhibited hearing losses. Early testing of hearing is indicated in order that proper otological care may minimize the effects of this additional handicap to their language potential. (2) Marked deficiency was exhibited in the auditory memory span for vowels and, in particular, in sound discrimination. (3) Syllable and tapping rates, as measured by the Sylrater, indicated that these children were deficient when compared with normal standards. (4) The large number of sound substitutions (10 per cent of all sounds tested) and the sounds found most frequently defective indicated the immaturity of the speech of these children. (5) Articulatory indices pointed out that whether repeated sounds and words, or spontaneous words based on picture stimuli were used, approximately the same results were obtained. Different results were found in the use of tests involving conversation. (6) Coefficients of correlation obtained to determine the interrelationships of all measures used indicated that, in every instance, the correlations between M.A. and the other scores were higher than those between C.A. and the same scores. When M.A was held constant, the partial correlation coefficients between C.A. and determinants of articulatory skill, as well as the articulatory proficiency measure, decreased markedly. On the other hand, the partial correlations between M.A. and the five variables increased in three of the relationships when C.A. was held constant. (7) The interrelationships between the five measures presumed to affect articulatory proficiency indicated that these measures were not related to a highly significant degree with the exception of the maximum repetitive rates for syllable production and hand tapping.

References

1. Anderson, V. A. Auditory memory span as tested by speech sounds. Ph.D. Dissertation, Univ. of Wis., 1937.
2. Beebe, H. H. Auditory memory span for meaningless syllables. *JSD*, 9, 1944, 273-276.
3. Benda, C. E. *Developmental Disorders of Mentation and Cerebral Palsies*. New York: Grune and Stratton, 1952.
4. Birch, J. W. and Matthews, J. The hearing of mental defectives: Its measurement and characteristics. *Amer. J. ment. Def.*, 55, 1950, 384-393.
5. Davis, H., ed. *Hearing and Deafness*. New York: Murray Hill Books, 1947.
6. Carmichael, L., ed. *Manual of Child Psychology*. New York: Wiley, 1946.
7. Federal Security Agency, Public Health Service, Nat'l. Instit. of Ment. Hyg. *Patients in Mental Institutions, 1948*. Washington, D. C.: Govt. Printing Office, 1951.
8. Gens, G. W. The speech pathologist looks at the mentally deficient child. *Train. Sch. Bull.*, 58, 1951, 19-27.
9. Hildreth, G. The development and training of hand dominance: I. Characteristics of handedness. *J. gen. Psychol.*, 75, 1949, 221-245.
10. Irwin, J. V. and Becklund, O. Norms for maximum repetitive rates for certain sounds established with the sylrater. *JSHD*, 18, 1953, 133-139.
11. Irwin, J. V. and Duffy, J. *Speech and Hearing Hurdles*. Columbus: School and College Serv., 1951.
12. Kennedy, L. Studies in the speech of the feebleminded. Ph.D. Dissertation, Univ. of Wis., 1930.
13. Lindquist, E. F. *Statistical Analysis in Educational Research*. Boston: Houghton Mifflin, 1940.
14. Malzburg, B. World survey for cure of mental deficiency. *Amer. J. ment. Def.*, 53, 1948, 119-127.
15. Métraux, R. W. Auditory memory span for speech sounds: Norms for children. *JSD*, 9, 1944, 31-38.
16. Penrose, L. S. *The Biology of Mental Defect*. New York: Grune and Stratton, 1949.
17. Poole, I. Genetic development of articulation of consonant sounds in speech. *Elem. Engl. Rev.*, 11, 1934, 159-161.

18. SARASON, S. *Psychological Problems in Mental Deficiency*. New York: Harper, 1949.
19. SCHLANGER, B. B. An analysis of certain factors affecting the speech proficiency of a group of mentally deficient children. Ph.D. Dissertation, Univ. of Wis., 1952.
20. SHERMAN, M. *Intelligence and Its Deviations*. New York: Ronald Press, 1945.
21. SIRKIN, J. AND LYONS, W. F. A study of speech defects in mental deficiency. *Amer. J. ment. Def.*, 46, 1941, 74-80.
22. SPRIESTERSBACH, D. C. AND CURTIS, J. F. Misarticulation and discrimination of speech sounds. *Quart. J. Speech*, 37, 1951, 483-491.
23. STRAUSS, A. AND LEHTINEN, L. *Psychopathology and Education of the Brain-injured Child*. New York: Grune and Stratton, 1950.
24. TEMPLIN, M. C. Spontaneous versus imitated verbalization in testing articulation in preschool children. *JSD*, 12, 1947, 293-300.
25. ———. A study of sound discrimination ability of elementry school pupils. *JSD*, 8, 1943, 127-132.
26. TERMAN, L. M. AND MERRILL, M. A. *Measuring Intelligence*. New York: Houghton Mifflin, 1937.
27. VAN RIPER, C. *Speech Correction* (2nd ed.) New York: Prentice-Hall, 1947.
28. WALLIN, J. E. W. *Children with Mental and Physical Handicaps*. New York: Prentice-Hall, 1949.
29. WATSON, L. A. AND TOLAN, T. *Hearing Tests and Hearing Instruments*. Baltimore: Williams and Wilkins, 1949.
30. WEST, R. KENNEDY, L. AND CARR, A. *The Rehabilitation of Speech*. New York: Harper, 1947.
31. WOOD, K. S. Measurement of progress in the correction of articulatory speech defects. *JSHD*, 14, 1949, 171-174.

Group Therapy With Preschool Children Having Cerebral Palsy

Ruth Coffman

Ollie Backus

EXPERIMENTATION with group therapy at the University of Alabama was expanded in 1951 to include a program for preschool children with cerebral palsy. This article constitutes a report of progress with that program.

The group has been composed of six children ranging in age from three to seven years. At the time of enrollment in the clinic the children's symptoms in respect to speech ranged from no speech at all to normal language development, and from severely labored and distorted articulation to the presence of only a few substitutions. The symptoms in respect to locomotion and manipulation varied from difficulty in using the left hand only to inability to walk, feed, or dress oneself.

These children have attended the speech clinic two hours each morning for a period of 12 weeks each semester. In accordance with a previously formulated definition of group therapy (*1*), the program consists of both individual and group instruction, i.e., both the two-person relationship of child with therapist and the multi-person relationship of child-with-peers with therapist. It is structured to provide participation in a variety of types of interpersonal situations. It also involves group therapy for parents as well as children.

There has been general recognition in the field that therapy for children with cerebral palsy should be based on the needs of those children to acquire motor skills in respect to eating, walking, using the hands, and speaking. There has not been general recognition that therapy should be based also on their 'emotional' needs, and that how well such needs are met will influence to a great extent their ability to acquire and use the motor skills. It is the belief of the writers that group therapy offers rich possibilities for meeting both types of needs. Since the literature in the field has provided explicit procedures for drill on motor skills, whether it be done individually or in groups, this discussion will be directed to the area of 'emotional' needs.

Importance of Meeting 'Emotional' Needs

Persons with cerebral palsy show so many surface manifestations strikingly different from other people, and therapy for them has been concentrated so largely on the direct attempt to reduce these differences, that it seems important to start this discussion with a basic postulate about human behavior. This postulate is being made

Ruth Coffman (M.A., Ohio, 1946) is Assistant Professor of Speech, Marshall College, and Ollie Backus (Ph.D., Wisconsin, 1933) is Professor of Speech and Director of Speech and Hearing Clinic, University of Alabama.

explicit in the various fields dealing with human behavior: All human beings are basically more alike than different. In the field of psychiatry, Sullivan (*2*) put it this way: 'We are all much more simply human than otherwise.'

One of the characteristics of being human appears to be that we not only experience events, we also *symbolize* them. From experienced events patterns of meaning are created which give rise to feelings of anxiety, resentment, well-being, security, etc. Such feelings involve the individual's perceptions of self in relation to others; they influence his needs together with the adjustive techniques he uses to meet these needs. The term *human behavior* includes not only 'structural' or 'biological' equipment, but also 'functional' or 'symbolic' or 'personality' organization. Persons with cerebral palsy, being human, symbolize as well as experience events. They have feelings of anxiety and resentment, they develop perceptions of self and others, they have needs for belongingness. But they have so little ability or freedom to express feelings and needs, and their behavior has been so largely viewed in terms of neurological injury, that the tensions indicating anxiety, resentment, and inferiority have been generally overlooked.

Another postulate on which this discussion is based refers to what is called 'learning': Each human being must do his own learning, rather than having it done to or for him. These postulates too are being made explicit in the various fields dealing with human behavior: The direction of the organism is forward toward growth; the task of teaching, of which therapy is a specialized part, is to provide an environment in which the individual becomes free to move ahead; the chief barriers to growth are in the area of personality organization—weakness in self-esteem, anxiety, hostility, etc. Again, persons with cerebral palsy, being human, must do their own learning. For them as for others, the process of teaching must include more than drill; it must provide an environment which helps them become free from barriers to growth, both so they can acquire needed motor skills and so they can become able to use those skills they have acquired.

Prolonged personal acquaintance with older clients with cerebral palsy has offered some validating evidence for these postulates. One 24-year-old boy, for instance, who had been able for months to produce normal [s] and [z] sounds finally realized why he had not moved ahead to use these sounds in speech. He had been operating on the non-conscious assumption that people would be able to like him only in the sense of feeling sorry for him; that once his defective speech was gone he would have nothing to offer by way of making friends. As he was able to develop perceptions of greater personal worth he became able to use more normal speech. A 19-year-old boy had many grotesque facial distortions. Gradually he gained more understanding of his deep-seated feelings of rejection with attendant hostility, and developed feelings of greater security in interpersonal relationships. His facial distortions, which formerly had been assumed to stem from the cerebral palsy condition, largely disappeared. A 25-year-old boy had developed very little use of the hands all through school and college. He discovered that his attitude toward writing had been associated with resentment against feelings of rejection from his mother. Within a month of self-initiated practice he made more

progress in writing legibly than he had for years. He also eliminated some power mechanisms from his behavior such as stopping people in the halls to engage in prolonged conversations, making unnecessary demands for help, exerting pressures for social engagements, etc. He discovered that while he needed to be physically quite dependent on others, he could become psychologically quite independent.

Such experiences as these made the writers deeply sure of what they wanted to help the preschool children accomplish at an early age so that each would be free to move ahead to develop his potentialities to the utmost.

Procedures for Meeting Needs

It is considered axiomatic that all children, regardless of age or ability, have a need to experience feelings of success and approval from others. Such a need is often accentuated in cerebral palsied children because of limitations which make impossible the performance of tasks for which approval may be given. Within a group structure it becomes easier to succeed when one is among peers who also have limitations in speech and other motor abilities. Bonnie, seven years of age, had been compared unfavorably at home with a twin who does not have cerebral palsy. She now finds that within the group she is the one most able to perform certain tasks. Here, despite the motor difficulty of the left hand, she assumes the role of 'hostess,' helping the other children with their coats when it is time to leave. Former perceptions of self appear markedly changed. Instead of her habitual response, 'I can't do it,' she now initiates requests, such as, 'Let me pass the cookies,' or 'Let me put on the record,' when it is time to listen to music. She seldom refers now to her crippled hand, but instead calls attention to the fact that she can mark on the board holding the chalk in her left hand or can string beads using both hands.

Closely allied to a human being's need for success and approval is his need for security and belongingness. It seems evident that children with cerebral palsy must frequently experience feelings of isolation in the family group and that such feelings must profoundly influence their development. Jo Ann, a five-year-old, had parents who were financially able to hire a full-time maid to care for her. While she was undoubtedly fortunate to have the close companionship which the maid afforded, both the parents and therapist recognized that even this arrangement probably created feelings of isolation from the mother, whose attention needed to be given to younger children. Moreover, there is the problem of interaction of other siblings with the cerebral palsied child. As brothers and sisters are invited to clinic parties, one observes that they tend to sit and watch rather than take part in the activities which of necessity are adapted to the motor difficulties of the group. It is felt that group therapy has a particular contribution to make in relation to these problems in that it is structured to provide many experiences which emphasize warm personal relationships between the children. Such experiences include: greeting other children with 'Hi,' exchanging toys using a speech response such as 'For you' or 'Have one,' choosing a child for a turn, pushing the chair of a child unable to walk alone, helping another wipe his mouth after drooling, assisting in the process of putting on a bib for the lunch hour, singing in unison while keeping time to music. The obvious signs of pleasure in the children,

not only during but also after group interaction, lend support to the assumption that belongingness in the therapy group tends to counteract the almost inevitably experienced feelings of isolation outside.

A significant aspect of human growth is the developing ability to depend on self rather than others. Because children with cerebral palsy are factually so dependent on the people in their environment, they may easily acquire feelings of helplessness and dependency. If such perceptions of self are present they need to be modified in therapy. Janet's parents were disturbed, for example, when she began using less speech than previously at home, although at the clinic she was talking more. A new baby brother about a year old was beginning to walk, something which Janet at the age of five was still unable to do. He was demanding more attention and getting it. In accordance with modern behavior theory it was assumed that at a non-conscious level the child felt that if she could become like a baby again she might receive the attention she felt she needed. Besides helping the parents solve this problem at home, the therapist attempted to provide a great deal of warmth and acceptance in the clinic, and saw to it that Janet was praised for such signs of independence as eating a cookie with relatively little assistance or placing her arms in the sleeves of her coat. Within a few weeks the symptoms had decreased markedly. Another child, admitted to the clinic at the age of three, was unable to leave his mother without crying. The mother was allowed to stay and the child was helped to work through the feelings of dependency to a point where he became able to remain the full two hours without her.

There is also the problem of expressing resentment or hostility. The writers have become increasingly aware of the relative lack of manifestations of hostility in these children. They are inclined to sit quietly, to follow instructions as given, to show little curiosity if presented with a new situation. Yet it is evident from reports of parents and adult clients that they do experience feelings of hostility. One wonders to what extent motor difficulty interferes with the expression of such feelings. Pounding, for example, can serve as an effective release for feelings, but if one cannot hit the peg with the mallet such an activity is of little value for releasing feelings of aggression. It could, in turn, create additional feelings of frustration. It is possible, however, with careful planning in accordance with a given child's motor ability to find ways of helping him express such feelings. For example, Donna was able to knock over a stack of blocks and to tear paper. Another child who became able to pound named each of the pegs in the peg board a particular person in her world, and proceeded to pound them vigorously with the wooden hammer. When these children can learn to express feelings of hostility early, on the preschool level, the assumption is made that they will be able to avoid some of the intense feelings customarily found among adults with cerebral palsy.

Children with cerebral palsy are also lacking in the real life experiences which other children have as they move about exploring their world. How can a child know that the stove is hot unless he can get close enough to touch it and experience the resulting sensation for himself? It seems evident that a major goal in therapy should be to help these children, insofar as possible, have varied sensory experiences which will contribute to

growth both physically and emotionally.

Recently, for instance, the children were taken out under the trees near the clinic for a picnic. Each child brought his own lunch from home with one item of food for himself and an additional one to share with another child. No child was carried to the picnic even though it took additional time to assist in transporting them on foot, in movable chairs, or on tricycles. Another day lunch was served inside, cafeteria style, with one child as cashier and the rest as customers. The two items on the menu made it possible for them to have a choice as well as providing opportunity for them to use speech responses such as 'May I have one,' 'How much,' and 'I want some.' At the Christmas season the children were taken into the country to cut and bring back their own Christmas tree, which they then decorated with ornaments they themselves had made. Other experiences have included: working with clay, playing in the sand, finger painting, and assisting with the care of two turtles which live in the therapy room. Sam, a child of three, who has had difficulty focusing on objects and coordinating hand movements, has watched the turtles intently, reaching out to grasp them in his small fist. Such an activity has been much more absorbing than working with standard equipment for occupational therapy.

Group therapy with the parents is considered as important as with the children. Membership in a group of parents having similar problems provides needed support and reassurance in facing their problems. The discussion begins matter of factly that having a child with cerebral palsy creates problems of great magnitude: the sheer physical labor involved, the difficult relations with other children in the family, the need of social life for the father and mother, etc. The parents' feelings of guilt and resentment are also discussed. Mothers are encouraged very early to raise the question, 'What's right with my child?' instead of viewing him in terms of the more obvious limitations. The gains each child is making are put within the frame of reference of the child compared with himself rather than with other children. Certain special problems are discussed with possibilities for solution. For example, John's mother told of her difficulties with him in regard to toilet training. As she talked it became apparent that the child was using this as a power mechanism to express hostility against the mother. Her freedom to bring this problem to the group, the group's interest in and acceptance of her enabled her to solve this problem within a week.

In summary, the point of view has been presented that therapy for children with cerebral palsy should be based upon 'emotional' as well as 'motor' needs and that how well such needs are met will influence to a great extent their ability to acquire and use motor skills. Some of these needs have been described and procedures for meeting them suggested.

References

1. Backus, O. The use of group structure in speech therapy. *JSHD*, 17, 1952, 116-122.
2. Sullivan, H. S. *Conceptions of Modern Psychiatry*. Washington, D. C.: William Alanson White Psychiatric Foundation, 1947.

Possibilities Of Research For Public School Speech Therapists

Mildred C. Templin

PUBLIC SCHOOL speech therapists can contribute much to the field of speech pathology through systematically planning their work so as to accumulate evidence on common recurrent problems. There are certain problems of research particularly amenable to study and investigation by persons who are in daily contact with children in a teaching or therapeutic setting. These problems are the concern of speech therapists. The fruitful study of them must be made within a research framework.

Year after year in schools throughout the country, public school speech therapists make decisions concerning the selection, diagnosis and retraining of cases. Fundamental to all these decisions is the desire to bring about the greatest amount of improvement in the speech of the largest number of children with whatever funds and facilities are available. In making each decision, public school speech therapists utilize their experience with speech defective children, their academic and professional training, and their knowledge of those research findings which have a bearing on the particular problem at hand. Although knowledge gained through personal experience is probably cumulative, breadth and depth of understanding increase with awareness of the contribution of current research to the theory and techniques of speech pathology. The best decisions take account not only of personal experience, but especially of objective, experimental evidence.

Several kinds of research undergird an adequate understanding of all aspects of speech correction: research designed to extend theoretical knowledge; investigations to develop, organize and evaluate techniques of therapy; and studies of the relationships of various aspects of speech to a variety of environmental factors. Research which increases knowledge of normal and deviate speech has only an indirect function in the treatment of speech cases. Examples of such research are found in studies of the adaptive speech behavior of the stutterer or in the development of speech sounds in infants and young children. Research which investigates specific practical problems and techniques of dealing with children defective in speech is of great immediate service to speech therapists even though it may not give definite or final answers in terms of the superiority of any particular method of therapy. Nevertheless, additional objective evidence of the relative effectiveness of several methods serves as a guide in suggesting possible procedures for any case. Research concerned with the relations

Mildred C. Templin (Ph.D., Minnesota, 1947) is Associate Professor at the Institute of Child Welfare, University of Minnesota. This article is based on a paper presented at the 1950 Convention of ASHA, Columbus, Ohio.

of speech deviations to various aspects of the enviornment are of use in suggesting ways to help a child by indirectly modifying his environment. Instead of investigating specific techniques of therapy these studies compare the home adjustment, parent attitudes, etc. of children with defective and normal speech and point out factors which therapists should take into account in their therapeutic practice.

In any research study there are three important parts: the formulation of the problem to be investigated in terms of a question or hypothesis; the planning of the experimental procedure so that evidence to support or reject an hypothesis is produced; and the carrying out of the research plan. Although public school speech therapists can assume an active role in all aspects, unless they have special training in research techniques, their greatest contribution can be made in formulating practical research problems and in gathering data for research studies designed by someone else.

The design of the experiment set up to obtain evidence on any specific question demands careful planning and knowledge of and training in research techniques. Some speech therapists in the public schools have this knowledge; many do not. The lack of training and knowledge, however, does not preclude participation in research. This understanding of research techniques, while it cannot be acquired quickly, can be acquired. In addition, individuals trained in research techniques are often willing to help in the planning of a study.

There is, however, need for a central agency which would plan studies growing out of the questions of public school speech therapists. Data could be gathered cooperatively by the therapists then analyzed and prepared for publication by this agency. It should be emphasized that complicated statistical techniques of analysis are not always needed in order to produce material wihch is valuable for the field of speech pathology. The most appropriate statistical technique will vary with the problem being investigated and the experimental design. Often, careful experimental controls and analyses using simple statistical techniques are most valuable.

The public school speech therapist is in an unusually favorable position from which to aid in formulating specific questions for investigation. This is a vital research role, since the most effective research grows out of seeking answers to specific questions or of testing specific hypotheses. The ever-present problems of the public school speech therapists need first to be well stated and then subjected to experimentation. There is some truth in the belief of many speech therapists that those whose chief concern is research, teaching, or working with individual cases are not aware of the many problems which confront therapists continually. Since practical problems as well as theoretical ones can be attacked experimentally, however, these problems provide opportunities for public school speech therapists to contribute to research by formulating questions which grow out of their own experiences. The objective statement of a problem usually brings with it greater understanding of the factors involved in that problem.

There are many ways in which speech therapists can guide some practical research in the direction most useful for themselves. Simple things such as listing problems as they arise and bringing them to the attention of persons primarily concerned with re-

search are important. Speech therapists can communicate their needs to specific research persons through personal contact. They can communicate them to a large number of research people through speeches and symposia at convention or through articles in appropriate journals. The contribution made by posing questions appears not only in the increased vitality in the field of speech correction, but also in the professional growth of the individual therapists.

No speech therapist should hesitate to propose a needed research problem because he sees it as a simple practical question rather than as a well formulated hypothesis. Theories of development of speech, of learning, and of many other aspects of human behavior are being continually modified or formulated. The descriptive evidence which is gathered to answer simple questions is frequently the basis for both the statement and the modification. Many scientists believe that theories should be built upon accumulated evidence rather than that the evidence should be gathered in relation to a particular theory.

The fact that speech therapy keeps the therapist in contact with large numbers of speech defective children for periods extending from several months to several years is important for the speech therapists' role in research. The thorough study of any of the important, recurrent problems requires following the progress of children over a considerable period of time. Since learning is usually gradual and irregular, a substantial training period is often necessary if meaningful results are to be obtained in the evaluation of policies and techniques. Studies by persons who are not in constant, direct contact with children must often be limited to observations over a few weeks or a few months and the validity of these studies is unfavorably affected by this factor.

Much data can be gathered by public school speech therapists without substantial change in their regular program of therapy if the procedure of a study is carefully planned in relation to the purpose before speech rehabilitation begins in any school year. Testing procedure and record forms can be worked out; time of testing and method of analysis can be decided upon and dovetailed into the therapy program. This can be accomplished with a minimum of interference with the primary program of speech therapy.

How speech therapists can gather data as part of their regular work can be illustrated in consideration of one of the common questions: At what age should school children first be given speech therapy? Although this problem is not new—the Blantons (*1*) posed it in 1919—little experimental evidence on it has been published. To attack the problem experimentally it must be taken out of the general framework of therapy and stated as an hypothesis to be accepted or rejected in the light of the evidence gathered: e.g., 'Kindergarten children should not be given speech therapy.' The study must then be planned so that the evidence obtained will or will not support the particular hypothesis being investigated.

The restatement of the question as an hypothesis makes apparent various considerations which are closely associated and help to delineate the problem. Among these are the optimal age for the beginning of retraining, the evaluation of the degree of growth toward mature articulation which has been accomplished, and the prediction of the liklihood of successful comple-

tion of the growth process without specialized training. In determining the optimal age for beginning retraining the speech therapist must take into account the ease of the child's learning the particular task or skill, the need for this skill in a social situation, as well as the most economical or profitable use of her time. Optimal ages are not necessarily the youngest ages. Given a minimum of motor, intellectual and perceptual ability it is possible to teach children to do many things which do not make sufficiently significant contribution to their welfare to warrant the time spent in training.

Since most kindergarten children achieve accurate speech sound articulation without any special training, speech therapists in selecting cases for retraining at the kindergarten level should be predicting which children will not achieve a satisfactory level of articulation development by seven and one-half or eight years, the age when, on the average, mature articulation is achieved (*2, 3*). For this prediction to be most nearly accurate, certain questions associated with the problem of the age at which to begin therapy need to be considered in the design of the study. Will children who produce several sounds incorrectly profit more from therapy than children who produce only one sound incorrectly? Will children having certain defective sounds (e.g., [f r l]) profit more from therapy than children with other defective sounds? Will children with gross inaccuracies in the production of any particular sound profit more from training than those whose inaccuracies approximate the desired sounds?

The next consideration is planning the procedure to obtain the evidence. While an experiment designed to gain evidence on when therapy should be begun with children can vary considerably, one suitable procedure is the technique of matched groups. In this technique two groups are initially equated on their level of articulatory development; then one group receives therapy and the other does not. After the training period has elapsed the progress of the two groups is compared to determine the effectiveness of the training.

A study using a matching technique can readily be incorporated into the regular speech program. For any speech therapist, after the evaluation of the speech of all kindergarten children those having speech defects would be divided into two matched groups, similar insofar as possible, in severity and type of speech deviations. To do this, for each girl with a severe lingual lisp placed in the group receiving therapy, another girl with a severe lingual lisp would be placed in the group not receiving therapy. A similar assignment would be made for boys and girls and for all types of defects—mild and severe lingual lisps, lateral lisps, [w] substitutions and so on. One of the matched groups (the experimental group) would be given speech therapy, and the other group (the control group) would be given no training beyond that which kindergarten experience offers. At the end of the first semester and at the end of the school year the speech sound articulation of the two groups would be compared to determine whether or not significantly more progress had been made by the group receiving therapy.

Most public school speech therapists do not have time to work with all children who would profit from training since there are so many children in the public schools with speech deviations. Accordingly, during any given year, some children judged to be

in need of therapy will not receive it. A selection of cases according to such a purpose postpones therapy for some children, which is inevitable anyway, in a way that evidence is provided for deciding when and which children could most profitably and economically be given therapy in future years.

If one therapist for one year carried on such a program a little knowledge would be gained. If she continued her study for several years, more information would be added. The question of when to begin therapy is common to the majority of public school speech therapists. If a substantial number of therapists selected the cases to be worked with in a systematic manner for only a few years, objective evidence on which to base the decision of the optimal age to begin therapy would soon be accumulated.

Such a procedure is likely to receive criticism, since some parents and teachers are primarily interested that a particular child receive therapy. The plan, however, is analogous to medical research on the effectiveness of certain remedies. Here the medication being investigated is given to some patients while others are given placeboes. Since it has been possible to educate portions of the public to accept this procedure in medicine it should be possible to educate parents, teachers, and principals to accept a similar procedure in speech pathology.

Although the problem of whether speech therapy should begin in kindergarten has been selected to serve as an example of the kind of research data public school speech therapists might contribute, other recurrent problems, too, can be attacked as part of the regular remedial program. For example, among these questions are whether to identify speech deviates through a survey conducted by the therapist, by teacher referral, or by some other method; whether to give priority in therapy to children with slight speech deviations or to those who have serious speech problems; whether to form homogeneous or heterogeneous articulatory retraining groups.

Public school speech therapists are forced to make frequent decisions on practical problems which confront them and which are amenable to experimental study. Their chief role in research lies in formulating specific questions about the problem and in gathering research data on the questions. Continuous contact with the same children over a period of time makes possible the evaluation of particular remedial techniques and procedures. Often this can be done with a minimum of extra work merely by setting up in advance criteria for the selection of cases in terms of these specific questions and by making careful records throughout the period of therapy. Therapists not trained to design experimental studies can contribute to the development of research in the field by cooperating in the collecting of data in studies designed by others. A central research agency responsible for designing studies and analyzing the data in problems associated with speech therapy would facilitate this.

References

1. Blanton, M. and Blanton, S. *Speech Training for Children.* New York: Century, 1919.
2. Poole, I. Genetic development of articulation of consonant speech sounds. *Elem. Eng. Rev.*, 11, 1934, 159-161.
3. Templin, M. C. The development and interrelations of certain language skills in children. (In preparation)

Audiometric Testing Of Hearing Of School Children

Samuel M. Wishik

Elizabeth R. Kramm

ROUTINE audiometric testing of school children is generally accepted as an effective method of detecting hearing deficiency among school age children. Less unanimity of opinion exists concerning the most desirable frequency of periodic re-testing. Practices vary from an audiometric test of each child only once during his entire school career to annual re-testing.

Ciocco and Palmer (*1*) reported on changes in children's hearing that took place over a five-year interval up to 1937. They emphasized the importance of ear infections as a cause of hearing impairment among children. Since the time of that study, the advent of antibiotics has considerably reduced the occurrence of ear infections. The present paper reports the findings of a study of a current program of periodic audiometric testing and the possible conclusions that might be drawn with respect to desirable frequency of re-testing.

Samuel M. Wishik (M.D., Columbia, 1929; M.P.H., Johns Hopkins, 1948) is Professor of Maternal and Child Health, and Elizabeth R. Kramm (M.A., North Carolina, 1951; M.P.H., California, 1951) is Research Associate, Graduate School of Public Health, University of Pittsburgh. This article is based on a report of the School Health Committee of the Pennsylvania Public Health Association: Elmer B. Cottrell, John W. German, Jr., Mildred Hall, Thomas E. Shaffer, and Samuel M. Wishik, Chairman. Acknowledgements are extended to Thomas H. Ford, N. G. Angstadt, and Elvira Koch, of the Reading School District; and Gladys B. Fish of the Pennsylvania Department of Public Instruction.

Study Method

In the school system under study, the routine procedure calls for an examination of all pupils in the first, third, and fifth grades. Children who, for one reason or another, fail to receive the routine test in those grades are usually tested in the next years. In some instances children are also tested in kindergarten before entering the first grade. Children who fail a test in any given year are often re-tested the following year.

During the summer of 1952, data for the study were taken directly from the individual health records and audiometric test reports of pupils who had completed the fifth or sixth grades in the public schools of the Reading School District. For each child, a record was made of passing the audiometric test, failing, or not being tested during each year from kindergarten or the first grade through the fifth or sixth grades. All children in the fifth and sixth grades in the 1951-52 school year were included in the report except those who had transferred into the Reading District from other school areas. On the basis of these criteria, 1726 children, or 88 per cent of the 1957 pupils then enrolled

in the fifth and sixth grades, were included in the study. These children, therefore, were a homogeneous population group who had been subjected to a reasonably uniform method and quality of testing over a five- or six-year period. The children constituted 12 per cent of the total school population.

In the City of Reading, each child first has an individual puretone audiometric screening test by the sweep-check-method set at 15 decibels and ranging in frequency from 128 to 11,584 cycles. Any children who fail with either ear to hear two or more frequencies in the sweep at the 15 decibel level are called back the same day for a second test. The re-test attempts to determine the child's hearing threshold to progressively diminishing volume of tones within the same frequency range. Any child who fails at 20 decibels to hear any two tones in either ear is scored as failing. This threshold test is then repeated in two or three weeks to rule out transient hearing changes such as those accompanying a common cold. In the presence of respiratory infection, the last test is postponed until symptoms disappear. Approximately half of the children who fail the sweep-check test pass the threshold tests. On the final record, no child is considered a failure if he passes the last threshold test.

No qualitative analysis of audiograms is attempted in the present study. Findings are classified merely as 'pass' or 'fail.' The word 'failure' in the present paper, therefore, refers to failing the second threshold test. The word 'test' refers to a completed testing procedure composed of a sweep-check and two threshold tests. Not more than one 'test' is recorded for any child during any one year. In all, 5028 such 'tests' were done on the 1726 children.

If a child failed the sweep-check screening test and did not receive a follow-up threshold test, or if the results were not recorded on the pupil health card, he was considered for the purpose of this study as not having been tested. Any other tests, such as by phono-audiometer, whispered voice, or watch tick, were discounted.

Findings

Eighty-seven per cent of the children were tested at approximately the first grade, 93.6 per cent at approximately the third grade, and 94.5 per cent at approximately the fifth grade. Eighty-one per cent of the children received the desired three or more tests during the study period, although the intervals between these tests did not always conform to the biennial spacing.

Among the 74 children who were examined by an otologist after having failed the audiometric test, all but one had confirmation of hearing impairment. Even those with mild and previously unsuspected hearing loss were confirmed as having the hearing deficiency reported by the audiometric test. The remainder of the discussion in this article is, therefore, predicated upon an assumption of very high degree of reliability of the test reports.

One hundred twelve different children, or 6.5 per cent of the 1726 included in the study, failed at least once. It is important to give consideration to possible bias that may have been introduced by some children having missed tests and other children having taken more than the routine number. Among those children who missed some of the routine tests and, therefore, had a total number of tests less than the desired three, there was no significant difference in number of failures from those who were tested

TABLE 1. Distribution of children tested and failing one or more tests by number of times each child was tested.

Times tested	*Children tested*	*Children with one or more failures*	
		Number	*Per cent*
One or more	1,726	112	6.5
One	25	1	4.0
Two	295	15	5.1
Three*	1,231	45	3.6
Four	155	42	27.1
Five	20	9	45.0

*Routine procedure required three tests.

the routine number (Table 1). When the routine was exceeded, however, the proportion of failures rose sharply because those children had been referred for extra tests for special reasons.

In the lowest grades, 3.3 per cent of the children had at least one failure (Table 2). In the third and fourth grades, 4.0 per cent failed one or more times, and 2.2 per cent of pupils in the highest two grades of this study failed.

Forty-four per cent of the new cases were first discovered in the lowest grade group, a similar number in the intermediate grade group, and 12.5 per cent in the highest grade group in the study. Among these children first discovered at different grade levels, how many were definitely known to have had normal hearing in previous test periods as contrasted with children who might have had unrecognized and untested difficulty? In Table 3, 'candidates' are children who had been tested in the previous year or grade group and had not previously failed. Those re-tested in Group I are not representative of their grade level and do not have the same meaning as the older groups. In Group II (third and fourth grades), 2.2 per cent of candidates for first failure by re-test did fail and 0.9 per cent failed in the fifth and sixth grades. Among these candidates, the failures constitute the *actual increment of new cases* that would result from a complete program of biennial re-testing.

Children who pass the first test are likely, in preponderant proportion, to continue to pass in subsequent grades (Table 4). Among those who passed in the first grade group, 2.2 per cent failed when re-tested in the second grade group. Among those who passed both in the first and second groups, only 0.6 per cent failed when re-tested in the third grade group. Among those who failed the second time, though having passed in the first

TABLE 2. Number of children tested and number and per cent failing at least once by grade group.

Grade Group	*Children tested*	*Children failing*	
		Number	*Per cent*
I (Kindergarten, First, Second)	1,503	50	3.3
II (Third, Fourth)	1,613	66	4.1
III (Fifth, Sixth)	1,645	37	2.2

TABLE 3. Candidates for first failure by re-testing and increment of new cases discovered by retesting children who passed previously by grade group.

Grade Group	*Candidates for first failure by re-test*	*Increment of new cases discovered*	
		Number	*Per cent*
I (Kindergarten, First, Second)	125	7	5.6
II (Third, Fourth)	1,391	31	2.2
III (Fifth, Sixth)	1,452	13	0.9

TABLE 4. Re-test findings among children who *pass* tests in first grade group.

Group 1 (Kindergarten, First, Second)	*Group 2 (Third, Fourth)*	*Group 3 (Fifth, Sixth)*
	Passed: 1333	Passed: 1264 Failed: 8 Not tested: 61
Passed: 1453	Failed: 30	Passed: 22 Failed: 5 Not tested: 3
	Not tested: 90	Passed: 85 Failed: 0 Not tested: 5

grade group, 18.5 per cent failed when re-tested in the third grade group. In all, among those children who passed when tested in the first grade group, 0.9 per cent showed or retained a failure in the last grade group covered by this study.

It is important to point out that even among children who have gone through four or five years of passing repeated audiometric tests, one in 166 failed when re-tested at 10 or 11 years of age. This finding strongly substantiates the advisability of giving at least three tests over the six-year period.

On the other hand, as revealed by Table 5, among the 50 children who failed when tested in the first grade group, 39.5 per cent failed again if tested in the next grade group, and 72.2 per cent of these if tested a third time. In all, 26 per cent of the children who failed at the time of testing in the first grade group retained that failure in the latest grade group covered by the study. Without correcting for those who missed tests in one grade group or the other, the likelihood of first failures showing failure after six years was 32 times as great as among those who passed in the first grade group.

It would seem reasonable, therefore, to omit children with previous failures from the routine biennial testing, to discontinue subjecting these children to the initial sweep-check test and to establish for them a special procedure of annual complete audiogram studies. It is suggested that once a child has failed, he continue to be followed by the special rather than routine procedure until he passes a subsequent carefully done test. As shown above, once he does pass, he is not very likely to return to the failing category.

Another approach to the question of how many additional cases are uncovered by repeated testing would focus on the number of successive tests at one or more year intervals without necessarily considering the grades in which the tests were done. This would show at which of a number of successive tests the children with hearing impairment were discovered (Table 6). If only one test had been given to the children, 51 children or 45 per cent of the cases of hearing impairment would not have been detected. If the program had stopped short after two tests had been given,

TABLE 5. Re-test findings among children who *fail* tests in first grade group.

Group 1 (Kindergarten, First, Second)	*Group 2 (Third, Fourth)*	*Group 3 (Fifth, Sixth)*
	Passed: 29	Passed: 25 Failed: 0 Not tested: 4
Failed: 50	Failed: 19	Passed: 5 Failed: 13 Not tested: 1
	Not tested: 2	Passed: 2 Failed: 0 Not tested: 0

16 per cent would have been missed. Three tests would have detected almost all the cases. This approach indicates that without regard to the interval between the tests, as long as at least one year intervenes, two or more tests are warranted in respect to the proportion of cases uncovered.

Since the routine procedure in the Reading testing program was that of a biennial rather than annual examination, it is not possible to know how many children with temporary hearing difficulty of not more than one year's duration were missed. An indirect clue to this might be drawn from the fact that 385 times in the period under study children who had previously passed all their tests had an opportunity, for one reason or another, to be re-tested after a one-year interval. Sixteen or 4.1 per cent of these chances were followed by a failure. This is undoubtedly a higher percentage than one would expect to pick up in a routine annual testing of previously apparently normal children. Nevertheless, these children did develop hearing deficiency within a one-year period. Although the numbers are small, there seems to be a somewhat greater tendency for such hearing deficiency to develop in a one-year period among the younger children than among those in the upper grades of the present study.

The preceding emphasis on the child with temporary hearing impairment stems from the large proportion (55.4 per cent) of the failures in the present study that fell into that category (Table 7). Within the limitations of the gross findings available in the present study, it is not possible to state in how many of these children the hearing impairment cleared up spontaneously and how many of them recovered as a result of treatment that was instituted because of the audiometric program. In either event, it is clear that school age children develop hearing impairment of a non-permanent nature at all times during the first six grades and that within a one-year period or the two-year interval between routine testing, such hearing impairment may persist for varying lengths of time, sometimes long enough to have definite effect upon the child's educational progress and other adjustments. That these non-permanent hearing impairments are not episodes of a day or week is known because of the interval that

TABLE 6. Increment of new cases discovered by re-testing by order of test when first failed.

Order of test	*New cases*		
	Discovered	*Not yet discovered*	
		Number	*Per cent of total new cases*
First	61	51	45.5
Second	33	18	16.1
Third	16	2	1.8
Fourth	2		

TABLE 7. Number and percentage distribution of new cases by duration of hearing impairment.

*Duration**	*New cases*	
	Number	*Per cent*
All types	112	100.0
Chronic	40	35.7
Temporary	62	55.4
Indeterminate	10	8.9

*Criteria for duration of hearing impairment: *Chronic*, failure to pass a test in more than one year; *Temporary*, failure to pass a test in only one year but with a pass in a subsequent year; *Indeterminate*, failure to pass in only one year but with no subsequent tests.

exists in the Reading procedure between the first screening sweep-check test failure and the final threshold test before referral for otological examination. Furthermore, varying delays undoubtedly occur between referral and the medical examination which, in this series, almost invariably confirmed the finding of hearing impairment despite that delay.

Conclusions

1. In the first six grades, 6.5 per cent of children given audiometric tests failed at one time or another. In the lowest grades, 3.3 per cent of children failed, 4.0 per cent in the third and fourth grades, and 2.2 per cent in the two highest grades investigated.

2. Finding of new cases amply justifies a program of biennial testing through the first six grades. Among third and fourth grade children who previously passed audiometric test, 2.2 per cent failed when re-tested. Among fifth and sixth grade children, 0.9 per cent of such candidates for first failure on re-test failed.

3. A significant number of children have impaired hearing for periods of less than two years duration but of more than several weeks duration. It is not known whether annual testing would detect a sufficient number of additional cases to warrant the more frequent schedule.

Reference

1. Ciocco, A. and Palmer, C. *The Hearing of School Children.* Washington, D. C.: National Research Council, 1941.

Group Auditory Training Unit For Preschool Children

Tina E. Bangs

James L. Shapley

TODAY, advances in amplifier design and audiometric techniques are making necessary a re-classification of many 'deaf' children into the 'hard of hearing' group. Hardy (*5*), Huizing (*8*), and Wedenberg (*11*) are among those who have emphasized this point. An example of the actual small proportion of deaf children has been reported by Goodman (*4*) who demonstrated in 1949 that approximately 96.5% of 345 children tested in schools for the deaf in England were found to have some residual hearing as measured by a Western Electric Model 6A audiometer. If we accept the philosophy that all children who have some residual hearing may profit to a degree from amplification while undergoing a language development program, then the available evidence implies that many more hard of hearing youngsters will be potential hearing aid users if auditory training programs are started at as early an age as feasible.

A few institutions have designed and constructed experimental group auditory training units, but the general trend in schools for the deaf has been amplification through portable or semi-portable commercial units. Although many of these instruments have one or more features generally considered desirable, such as compression amplification, binaural attenuators, tone controls, and sufficient power to overcome hearing losses of at least 100 db, the authors were concerned with these and other attributes which did not appear in one single unit. The purpose of this paper, then, is to present the criteria for an experimental group auditory training unit which will meet the needs of aurally handicapped preschool children, and the description of the design of such a unit.

Tina E. Bangs (M.A., Washington, 1941) is Assistant Director, Houston Speech and Hearing Center, and James L. Shapley (M.A., Washington, 1952) is a graduate student, State University of Iowa.

Criteria

Components. In so far as possible, the unit should be constructed with commercially available components.

Adaptability. The unit should be adapted specifically for children from 12 months through the five-year level. This feature is in line with the philosophy that maximum benefits in amplification should be provided preschool children before their language education is begun. Because modern audiometry is proving to be a fairly reliable method of determining the nature and extent of hearing losses in preschool children (*2*), younger and younger children are being diagnosed as severely hard of hearing rather than deaf. For these very young children,

size and weight of the headsets, sturdiness of controls, and placement of individual control stations need careful attention.

Accommodations. The unit should provide equal facilities for six children. Experience of the teachers in one center has demonstrated that groups of preschool children larger than six in number are difficult for one teacher to handle in an auditory training program. On the other hand, more than one child in a training situation makes for easier motivation and each pupil strengthens his learning by the repetition that must occur in group instruction.

Signal Inputs. The equipment should be as versatile as possible for training purposes, which means giving the children every possible listening opportunity in present day environment. Therefore, inputs for phonograph, tape, radio, and television sound should be provided. For live voice transmission, a directional hand microphone and a non-directional ceiling microphone should be included. For reasons of economy and simplicity, the addition of individual directional mikes at each station was not included in the initial planning.

Amplification System. Power Output. In order to reach severely hard of hearing children the unit should be capable of delivering speech signals from all 12 phones in the system with a minimum of distortion at a level at least 100 db above normal speech reception threshold for spondee words. Research programs at other institutions (*10*) have indicated that children with losses so severe that they cannot be measured by a standard pure tone audiometer can nevertheless profit from amplification.

Frequency Range. The amplification of all frequencies in the speech range should be uniform within plus or minus one db.[1]

Compression. The system should incorporate signal compression. For exceedingly hard of hearing children who have never before heard conversational speech or transient noises at loudness levels above their thresholds, a fear and dislike of sound is prone to occur. This has been substantiated during tours of schools for the deaf when the following question has been asked of the teachers: 'Do you have an auditory training program available to your students?' A common reply has been, 'Yes, but the children complain that their ears hurt if we make sounds loud enough to reach them.' Partly for this reason, auditory training has become only a minor factor in the curriculum of the profoundly hard of hearing, not because it was ill advised, but because improper amplification allowed uncontrolled transient sounds to reach impaired ears at disagreeable or painful levels of loudness. Undesirable variations in speech amplitude can be considerably reduced, however, by using a compressor circuit in an amplifier. A compressor circuit operates somewhat like an automatic volume control by regulating the average level of all signals exceeding a predetermined limit. The usual wide variations in speech amplitude can be effectively constricted to the

[1]This requirement is necessarily restricted to the amplifying system only. Although the responses of the entire system including microphones and earphones is of prime interest, the fact remains that microphones and earphones with essentially uniform response for a wide range of frequencies are expensive. The ceiling microphone used with this training unit is in the $35-$40 class and the earphones are the well known PDR-8 type. The objective here is to incorporate an amplifier which will not contribute significantly to the non-uniformity of the system as a whole.

narrowed range of tolerance of individuals with severe hearing losses. In this way those children with severe losses with or without recruitment can be helped to develop a tolerance for sound.

Monitoring. Both a monitoring headset and monitoring speaker should be included. Monitoring phones permit the instructor to evaluate qualitatively the signals being transmitted by the equipment following compression. In addition, the teacher can assist in inducing the children to don the phones if there is also a pair for her to wear. Use of a speaker assists the teacher in following phonograph recordings, tape recordings, television sounds, etc. in the training program. It also provides an acoustic link to children when they are actively using their own hearing aids in the classroom.

Master Gain Control. For purposes of initial training in recognition of sound and building tolerance for sound, the teacher should have a calibrated attenuator under her control which simultaneously influences the over-all amplification delivered to all sets of phones.

Output Stations. Individual stations should be included primarily for the purpose of providing independent controls for each youngster.

Controls. Each station should include a main control stepped attenuator to be manipulated by the child for the purpose of attempting to teach each child to adjust his over-all amplification to his own comfort level. This would demonstrate to the teacher the youngster's initial tolerance for sound in comparison with his needs as indicated by audiometric testing. Individual phone attenuators and separate high and low frequency roll-off controls at each station should be included for research purposes.

Phones. A high quality binaural[2] headset should be provided each station. Although there is a paucity of research in the area of binaural listening relative to threshold of speech and intelligibility scores, enough has been written (*6*) to indicate that further study is needed in this area. For purposes of research, then, binaural phones should be included and each phone be provided with a calibrated attenuator.

Calibration. A method for determining the output at each station for each ear should be provided. The importance of knowing the levels in decibels relative to the SRT or average pure tone loss[3] at which each child is listening during his training program was considered important both from the standpoint of training and research. The teacher could save time in her training program if she could initially set the output signal at the phones to just compensate for the average pure tone loss of the child, and then could proceed with increased amplification from day to day for purposes of building tolerance. In addition, the teacher could conduct a research program relative to the amount of amplification needed for individual children whose losses differ in their nature and extent.

Appearance and Durability. The unit should be aesthetically acceptable as well as durable. In order to assist in establishing and maintaining rapport

[2]The term 'binaural' is here restricted to 'two-ear' listening, or 'pseudo-binaural' as described by Hirsh (*6*).

[3]According to Carhart (*3*) the average of the losses measured at 512, 1024, and 2048 is a clinically useful value for estimating the Speech Reception Threshold of patients undergoing aural rehabilitation.

with the children, appealing colors and appropriate exterior decoration should be applied to the equipment, a minor yet important detail. Furthermore, if the children are expected to manipulate their own attenuators and handle their own phones, it is important that the equipment should be of durable construction.

Design

A block diagram of the group hearing aid unit which was designed to satisfy the requirements outlined above is shown in Figure 1. Six input channels are provided, each having its own gain control. Included in the six channels are two microphone channels employing a single stage of preamplification, and a ceiling microphone channel having two stages. A three-speed phonograph turntable is mounted in the top of a 23″ × 17″ × 36″ equipment rack containing the various amplifiers. A reluctance type pickup and its recommended pre-amplifier are used for the phono channel. The pre-amplifier-mixer unit was especially designed by one of the writers with particular attention given to wide range linear amplification with maximum reduction of internal hum and noise.

The combined output of the mixer amplifier connects to a commercially available amplifier with a compression circuit having an 18:1 compression ratio. In this amplifier the signal is attenuated to a pre-determined maximum allowable level .15 seconds after any input signal just exceeds a level where compression begins to take place. A further increase in the input voltage by 36 db increases the output by only two db. An indicating eye associated with this amplifier provides visual evidence of compression when the signal attains a level exceeding the pre-determined limit. Thus a type of automatic volume control action operates to maintain the average level of all compressed signals to within a relatively small dynamic range. The low impedance output of the compressor-amplifier provides both phone and speaker monitoring facilities.

From a point within the compressor-amplifier not affected by the two monitoring volume controls, the signal is connected to a calibrated potentiometer located on the console. This control provides for 90-db attenua-

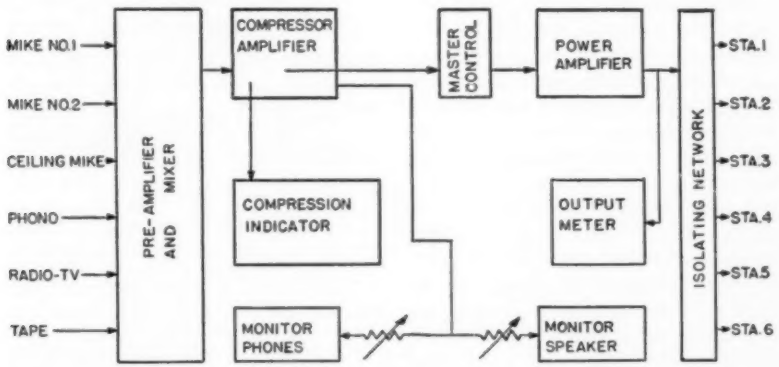

FIGURE 1. Block diagram of the group auditory unit.

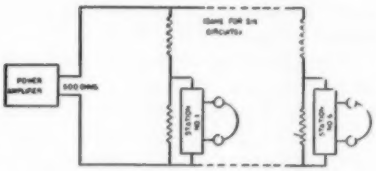

FIGURE 2. Circuit arrangement for connecting six stations to the power amplifier.

tion in three-db steps. The signal is then fed to a commercially available laboratory-type 20-watt wide range amplifier±one db, 20-20,000 cps. An output meter is bridged across the 500 ohm output of the power amplifier. This meter provides for visual monitoring of the relative signal level made available for all the stations.

A departure from the usual output circuitry was necessary, however, in order to satisfy the requirement of provision for separate low and high frequency cut-off controls at the several headset stations which could be set at will without materially altering the frequency characteristics at any other station. To solve this problem, 500 ohm circuits are employed and an isolating network is inserted between the power amplifier output and the individual lines to each of the six stations required. By using 500 ohm lines to each station, it was possible to use shunt and series condensers of nominal values to provide, respectively, high and low frequency attenuation slopes to the frequency characteristics of a given station. The isolating network, although introducing a large power loss in output, reduces the influence of a given station on the frequency characteristics of the others to a maximum of one db, no matter what frequency settings are chosen. When the power amplifier is driven to full output with a 1000 cps pure tone, the sound pressure level developed by the average PDR-8 earphone used in this system into a standard Type 1, 6 cc Coupler (*1*) is 117 db re .0002 dynes/cm^2. Care was taken to keep all input and output impedances properly matched in so far as possible with standard components so that a minimum of frequency discrimination occurs in the output to the phones when the frequency roll-off controls are in the 'flat' position. The isolating network circuit is shown in Figure 2.

All the electrical components of each station are housed in a metal box 3″ × 4″ × 10″. The controls and jacks are located on the face of the box as shown in Figure 3. The stations are bolted under the lip of a specially built table designed to seat three preschool children on each side. The lip of this table top extends far enough so that the entire station control box is covered by the table top.

The flat portions of the selector switches and attenuator shafts are filed more deeply at the bearing end of

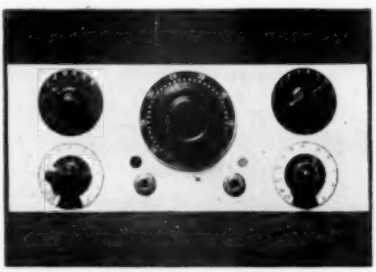

FIGURE 3. An individual station control box. The calibrated control in the center is the main station control. The upper left control is the low frequency roll-off selector, the upper right control the high frequency roll-off selector. The lower left control is the individual attenuator for the left phone, the lower right for the right phone. The phone jack for the left phone is identified with a black dot, the jack for the right phone with a red dot.

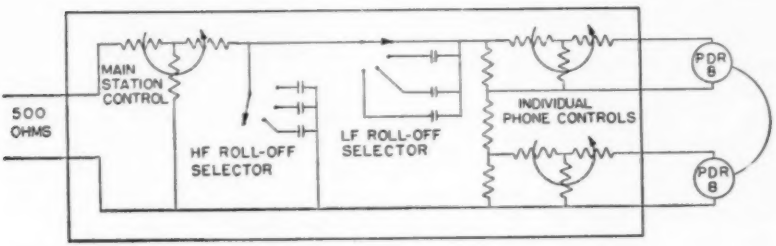

FIGURE 4. Circuit diagram of one station.

the shafts so that the knobs can not be pulled off so long as the knob setscrews are in place. At each headphone station a stepped attenuator is provided which controls the signal to both phones simultaneously. In addition, each phone of a given headset has its own attenuator, thus providing a means of attenuating each earphone independently. This arrangement is shown in Figure 4.

The individual phone attenuators are continuously variable rather than stepped. Dial markings of these attenuators were calibrated in db by instrument. A zero db reference was established empirically by determining the attenuator settings required for obtaining a threshold of intelligibility for normal ears using spondee words presented at a level which activated the compressor circuit. The maximum speech sensation level available relative to the threshold just mentioned is 100 db, a value obtained when there is no attenuation in the system. In order to determine the approximate sensation level of speech above normal threshold in a given phone, the readings on the three attenuators involved are merely summed and the resultant value subtracted from 100 db.

The headsets include two PDR-8 headphones for each station. They are assembled with rubber ear cushions, a plastic covered wire-type head band, and two two-conductor cords, all of light weight construction. Particular attention was given to the reenforcement of the mechanical attachment of the phone cords to their respective phones and jacks. One phone was painted red, the other black, and corresponding red and black flat-type phone plugs were attached. On the station box the phone jack for the right ear was coded with a red dot painted just above it, the one for the left with a black dot.

The equipment is designed so that no electrical shock is possible from physical contact with it. The console was mounted on four-inch rubber-tired casters which facilitates moving the unit across carpeted floors. The design and construction of the unit as a whole resulted in a maximum of simplicity, ruggedness, and quality, with a minimum of cost.

Upon completion of the electrical and mechanical assembly of the unit, the console and all the stations were spray-painted with a pale green washable enamel fitting into the color scheme of the classroom in which the unit is installed. To complete the decorative requirement, brightly colored animals and other figures were painted on all four sides of the console.

In order to test the philosophy that children previously and contemporarily considered deaf can be taught language through controlled auditory stimulation and its adjunct speech

reading, the writers have designed and constructed a group auditory training unit. This group unit was assembled to meet practical and exacting criteria for educational as well as research purposes. Brief experience with this equipment appears to justify the original concepts relative to language development in many of the so-called deaf children, and the techniques and results of future training with this unit will be presented in subsequent papers.

References

1. *American Standard Method for the Coupler Caliberation of Earphones.* Amer. Standards Ass. Pub., No. Z 34.9, 1949.
2. Bangs, J. L. and Bangs, T. E. Hearing aids for young children. *Arch. Otolaryng., Chicago,* 55, 1952, 528-535.
3. Carhart, R. Speech reception in relation to pattern of pure tone loss. *JSD,* 11, 1946, 97-108.
4. Goodman, A. I. Residual capacity to hear of pupils in schools for the deaf. *J. Laryng.,* 63, 1949, 551-579.
5. Hardy, W. G. *Children with Impaired Hearing.* Washington, D. C.: Federal Security Agency, Social Security Administration, Children's Bureau Pub., No. 326, 1952.
6. Hirsh, I. J. Binaural hearing aids: A review of some experiments. *JSHD,* 15, 1950, 114-123.
7. Hudgins, C.V. A rationale for acoustic training. *Volta Rev.,* 50, 1948, 484, 486, 488, 490.
8. Huizing, H. C. Auditory training. *Acta oto-laryng., Stockh.,* Suppl. 100, 1952.
9. Modern hearing techniques, pre-school and elementary levels. *Hearing News,* 19, 1951, 1-8, 20-22.
10. Silverman, S. R. The implications for schools for the deaf of recent research on hearing aids. *Amer. Ann. Deaf,* 94, 1948, 325-339.
11. Wedenberg, *E.* Auditory training of the deaf and hard of hearing children. *Acta oto-laryng., Stockh.,* Suppl. 94, 1951.

The Eyeblink Response As A Test For Hearing

Robert Galambos
Philip E. Rosenberg
Aram Glorig

THE PRESENT STUDY is a re-examination of the possible usefulness of the cochleo-palpebral, or eyeblink, reflex (*2*) as an objective test of hearing. Molinie (*9*), Gault (*6*), and Belinoff (*4*) appear to be the first to report systematically on the possibilities of this method, and with the measuring equipment of their time, concluded that it represented a useful test for simulated deafness. Subsequently considerable interest in this reflex was displayed (*1, 11*). As shown by Landis and Hunt (*8*), the eyeblink response is the most stable component of the startle pattern to loud sounds, and it is a compelling auditory reflex that is not brought under voluntary control even by persons like experienced pistol-shots who think they have done so. The purpose of this article is to describe a method that conveniently measures when eyeblink responses to sounds occur, and to present the results obtained when such responses are systematically examined in both normal and hard of hearing persons.

Robert Galambos (Ph.D., Harvard, 1941; M.D., Rochester, 1946) is Chief of the Department of Neurophysiology, Army Medical Service Graduate School, Philip E. Rosenberg (M.A., Maryland, 1951) is Research Audiologist, Aram Glorig (M.D., College of Medical Evangelists, 1938) is Director, Audiology and Speech Correction Center, Walter Reed Army Medical Center, Washington, D. C. The assistance of the personnel at the Sound Section, U. S. Bureau of Standards, is gratefully acknowledged.

Method and Procedure

The initial problem was to obtain a standard sound that would cause the eye to blink. To accomplish this a click was used. It was generated by a square wave from a Grass Stimulator (Model S4A) fed through a MacIntosh 50-watt Amplifier into a pair of Permaflux (PDR 8) earphones. A Hewlett Packard 5-watt attenuator was installed between the stimulator and the amplifier to control the intensity of the signal. With this system a square wave of 0.35 msec. duration produces a click with frequencies around 1000 cps predominating, and a maximum over-all sound pressure of about 134 db re .0002 dynes/cm^2 when no attenuation is introduced. This proved to be a sufficiently loud sound to elicit a blink at each application of the stimulus to a normal observer.

The next problem was to obtain a reliable measure of the eyeblink whenever it occurred. This is readily accomplished by transferring to an oscilloscope tube face the electrical output of a crystal that is activated

by movements of the eyelid. The crystal employed is the one used in an 'Astatic' phonograph cartridge; a one-inch length of stiff wire replaces the phonograph needle, and the whole is swivel-mounted on an ordinary otoscopic headband. When the wire is brought into contact with the eyelid, even very small lid movements generate significant electrical potentials. If these potentials are delivered to the vertical plates of a dual-beam cathode ray oscilloscope (Dumont type 322) whose sweep is initiated by the stimulus square wave, eyelid responses are regularly seen to follow the stimulation. The second channel of the oscilloscope has been used throughout to indicate the time base.

The individual to be tested was seated in a straight-backed chair with a headrest to hold his head reasonably immobile. The headband was strapped firmly around his head and the stiff wire adjusted so as to press against the eyelid lightly but securely while the eye was open. The phones were then placed over his ears. He was instructed to look straight ahead and relax.

Fifty-three subjects, of which 33 had hearing loss, were tested in this study. The usual technique involved recording from one eyelid and stimulating both ears. Control experiments showed that a monaural stimulus evokes essentially the same response from both eyelids. Where the two ears differ in sensitivity, binaural stimuli give eyeblink responses characteristic of the better ear as can be demonstrated by testing each ear separately also in such a person.

Clicks were delivered in a more or less random manner from one to five seconds apart. The resultant image on the tube face of the oscilloscope of both the eyeblink and the time line could be photographed for study.

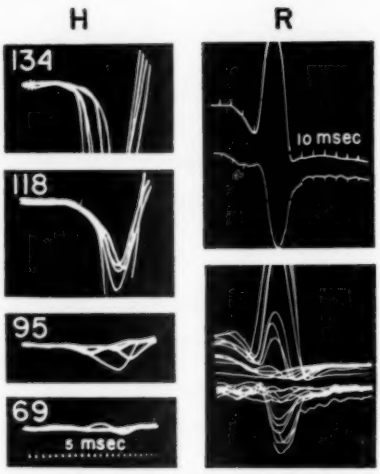

FIGURE 1. Oscillograms of eyeblink responses from 2 normal subjects (H and R). H: Recordings from one eye to binaural stimulation. Intensity of clicks given in upper left of each trace in db above .0002 dynes/cm². Five responses are superimposed in each frame. R: Simultaneous recording of left (above) and right eye responses to monaural (right ear) stimulation. Clicks at intensity giving about 50 per cent blink responses. The upper record shows response to a single click, the lower to 11 clicks at the same intensity.

Ordinarily, however, the observer merely examined the trace and decided whether or not a deflection in the eyeblink channel had occurred. These yes-no decisions were tabulated until at least 100 such judgments had been made for each stimulus intensity. From these data a percentage of responses for a given intensity was calculated and the results plotted (See Figure 2).

Test Results

Normal Hearing Subjects. The test was initially administered to 20 persons whose pure tone audiograms evidenced no loss of over 10 decibels at any frequency tested. The eyeblinks

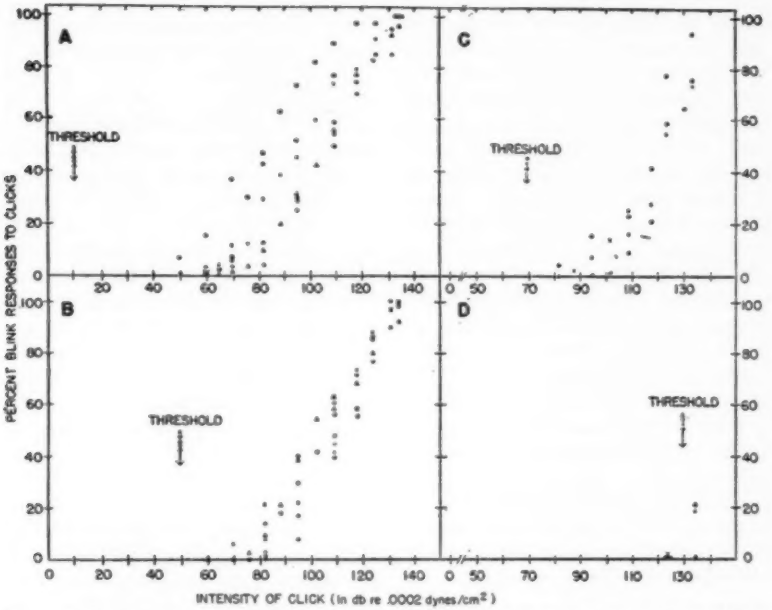

FIGURE 2. The frequency of blinking (ordinate) plotted against the intensity of stimulation. Each point represents the percentage of times a click of the indicated intensity produced a recordable eyeblink. Monocular recording, binaural stimulation. A, Normal subjects; B, Subjects with 40 db hearing loss to clicks; C, Subjects with 70 db loss; D, Subjects totally deaf by all tests.

of these normal subjects were photographed and analyzed (See Figure 1).

All subjects responded to the stimulus. At the highest intensity, each click elicited a blink and these blinks were easily observable on the oscilloscope. As the intensity decreased, however, the blinks came less frequently and became more difficult to see or photograph. At about the 60 db level the blink either disappeared entirely or became too small to be observable. Blinks occurred to 50% of the clicks when these were approximately 90 to 100 decibels above threshold (Figure 2A).

The latency of the response (i.e., the time between the click and the onset of the eyeblink) was remarkably constant at around 35 to 40 msec. On only two occasions were shorter latencies (around 20 msec.) observed, and, rarely, times of the order of 50 msec. were measured. Control experiments in which eyelid muscle action potentials were recorded simultaneously with the mechanical blink confirm the constancy of this latency and, furthermore, demonstrate the mechanical device to be about as sensitive to small eyeblinks as the muscle potential method.

Hard of Hearing Subjects. Mild Hearing Losses. Those individuals reporting hearing losses from 10 to 30 db demonstrated eyeblink responses and eyeblink response curves prac-

tically indistinguishable from those of normal subjects. Persons with impaired hearing above about 500 cps only also behave like normal individuals. Three such subjects, with losses at or greater than 50 db at 1000 cps and above, and consequently having severe speech discrimination difficulties, showed blink response at approximately the same intensities as would be expected of normals.

Moderate Hearing Losses. The eyeblink response curve of subjects with moderate hearing losses (40 to 70 db) differs from the normal in that blinks begin to appear at higher click intensities and the response curve is steeper; at the highest click intensities, however, each click evokes a blink (Figure 2B). The eyeblink itself, as it appeared on the oscilloscope, seemed identical with the eyeblink of the normal hearers. The latent period was also identical except in one case where it regularly measured 100 msec.; it was later discovered that this patient was deliberately attempting to feign a more severe hearing loss than the actual one and was purposely blinking following each click.

Severe Hearing Losses. Persons with hearing losses exceeding 70 db showed a typical compression of their response curve (Figure 2C). Blinks were elicited close to their elevated threshold and increased very steeply in both frequency and magnitude. At the highest click intensity the average maximum blink response was only 80%. Both the form of the blink and its latent period, however, were like those of normal subjects.

Total Hearing Losses. Several persons were tested who had been diagnosed as totally deaf. The few blinks obtained from this group were in response to clicks they professed vaguely to hear or 'feel.' Their blink curves are shown in Figure 2D.

Discussion

The neurological basis for the cochleo-palpebral reflex is not completely understood. Its efferent limb is the facial nerve, the origin of which lies reasonably close to the nuclei of the auditory-vestibular complex that obviously comprises its afferent limb. Exactly how the sensory-motor connections are made, and where, appear to be questions as open today as they were in Bechterew's time (*3*). On this point, it is pertinent to compare the latency for the middle ear muscle reflex to sound (10 msec.; see *10*) with that for the eyeblink (35 to 40 msec.). This discrepancy in these times is larger than can be accounted for solely by the longer conduction path to the eyelid muscles, and the implication is that the eyeblink pathway has a substantially larger central time. It is well also to ask whether it is the cochlear or the vestibular inflow that is here under study. This question cannot be answered with certainty, although it may be pointed out that the labyrinthine responses in one of the deaf subjects shown in Figure 2D were entirely normal. Finally, the contribution, if any, of higher integrating centers to the form and frequency of reflex blinking must be considered, if only to point out that this factor has not been adequately assessed in either animals or man.

These questions are all relevant to the problem of what aspect of the auditory nervous system the cochleo-palpebral reflex measures. If the neural mechanisms involved are essentially restricted to the medullary segments, it tests rather directly the capacity of the auditory nerve to activate sub-

cortical structures; if, on the other hand, higher integrating centers make important contributions, the data must be interpreted in another framework. Further discussion of this important point, which can probably best be settled by experiments on animals, is obviously outside the scope of the present paper.

The question now arises as to how, if at all, the cochleo-palpebral reflex might be used as a clinical test of hearing. All subjects with hearing blink to clicks of some intensity or other, while individuals with total organic deafness fail to respond. The psychophysical functions relating percentage of eyeblink responses to intensity of the click stimulus (Figure 2) show, furthermore, that certain significant and important differences exist in the curves obtained from people with various degrees of hearing loss. Normal subjects can certainly be differentiated from totally deaf ones, and these in turn can be differentiated from those with intermediate losses.

In the normal case the blink threshold is reached some 50 db above the avowed threshold. There is considerable spread in the exact point of takeoff, a finding that may reflect either substantial individual differences, inadequacies of the experimental technique, or both. Persons with moderate hearing losses begin showing responses at intensity levels representing perhaps 25 db above their avowed thresholds (Figure 2B). Those with severe losses (Figure 2C) begin blinking when intensities some 20 db above their thresholds have been attained. In those with total deafness, blinks appear at about the threshold to clicks. The fact that the interval between the threshold for hearing clicks and the threshold for responding to them with eyeblinks decreases so strikingly as the deafness increases makes it clear that the intensity at which eyeblinks begin to appear is a relatively poor measure of the absolute hearing threshold. Put another way, since a difference of only 20 or 30 db exists between the takeoff point for normal subjects and for those with 60 db hearing loss, the threshold for the blink response is relatively independent of the absolute threshold. This suggests that the eyeblink response, like the growth of loudness, might be subject to recruitment (*5*).

The intensity at which 50% responses are obtained is similarly relatively fixed and bears no consistent relation to the absolute threshold. In the normal subjects 50% responses occur at about the 95 db level, in those with moderate losses at about 110 db, and in those with severe losses at about 120 db. These differences are too small to permit using them as a reliable index of the absolute threshold. Finally, if the 100% point be examined with this aim in view, it is clear that such attempts would be even less successful. Thus, while it is clear that the function relating eyeblinks to intensity of stimulation is stable, none of its features is particularly useful for establishing the absolute threshold.

The one situation where the eyeblink test should prove highly reliable is in cases feigning very severe deafness. If clicks of moderate intensity (*e.g.*, 90 db above threshold for a normal subject) produce a relatively large percentage of eyeblinks, any claim that the tested ear has a hearing loss (for tones, clicks, or speech) greater than 70 db must be suspected. Thus when one patient who claimed total unilateral deafness gave an essentially normal eyeblink curve from the supposedly 'bad' ear, it was not surprising when he volunteered at the

conclusion of the test that his hearing was not really impaired.

For the subjects in this series, the results obtained by the eyeblink test and the hearing loss for speech test (7) showed good agreement except, as has been pointed out, where the loss is severe only above about 500 cps. The eyeblink response can be essentially normal if hearing is intact for low frequencies only, and this may be true for persons with marked hearing loss for speech.

The authors have also considered the questions of whether 'nerve' can be distinguished from 'conduction' deafness, and whether psychogenic deafness can be differentiated from malingering by the eyeblink test. The present series is probably too small to be certain on these points, but the evidence clearly favors a negative answer for them both. The conservative interpretation of the data available at this time permits one to say only that the eyeblink curve is reliably related to the intensity of stimulation by clicks, that the degree of deafness modifies the curve obtained in an orderly and systematic way, and that the test has proved useful, especially in conjunction with other information, in certain special cases where malingering or psychogenic factors are suspected.

Summary

1. A method is described for accurately establishing when sounds evoke eyeblinks. This method uses a square-wave generator and earphones for producing clicks, and a crystal phonograph cartridge and an oscilloscope for recording eyeblinks.

2. In normal subjects eyeblink responses begin to occur to clicks around 50 db above their threshold. The blinks occur more frequently as the click intensity is raised, and they appear every time when the clicks are at about 130 db above threshold.

3. Subjects with hearing loss respond like normal ones except that higher intensities are necessary to produce similar blink responses.

4. This test does not clearly differentiate organic from non-organic, or conduction from 'nerve-type' hearing loss. It can, however, be used to aid in the detection of certain types of malingering.

References

1. Alexander, G. and Marburg, O. *Handbuch der Neurologie des Ohres.* Berlin: Urban and Schwarzenberg, 1924.
2. Bechterew, W. v. *Die Funktionen der Nervencentra.* Vol. 1. Jena: Gustav Fischer, 1908.
3. ———. *Die Leitungsbahnen im Gehirn und Rückemark.* Leipzig: Eduard Besold, 1894 (See Fig. 8, p. 70). *See also Provodjshe puti spinnovo i volovnova mazka.* Vol. 1. St. Petersburg: Pikkera, 1896 (Figs. 132, 133 and 136).
4. Belinoff, S. Eine neue Methode der klinischen Anwendung auropalpebralen Reflexes (Bechterew). *Mschr. Ohrenheilk.*, 52, 1918, 423-438.
5. Fowler, E. P. Measuring the sensation of loudness. *Arch. Otolaryng., Chicago*, 26, 1937, 514-521.
6. Gault, F. Note sur l'utilisation du reflexe cochleo-orbiculaire pour la surdite. *Pr. méd.*, 24, 1916, 424-425.
7. Hirsh, I. J. *The Measurement of Hearing.* New York: McGraw-Hill, 1952.
8. Landis, C. and Hunt, W. A. *The Startle Pattern.* New York: Farrar and Rinehart, 1939.
9. Molinie, J. Reflexes oculaires d'origine auditive. *Rev. Laryng.*, 1, 1916, 385-393.
10. Perlman, H. B. and Case, T. J. Latent period of the crossed stapedius reflex in man. *Ann. Otol., etc., St Louis*, 48, 1939, 663-675.
11. Strauss, H., Landis, C. and Hunt, W. A. Acoustic motor reactions especially the cochleopalpebral reflex. *Arch. Otolaryng., Chicago*, 28, 1938, 941-945.

The Threshold Reliability Of Recorded Sustained Vowels

William R. Tiffany

WHILE IT IS NOT to be denied that recent developments in speech hearing test design have markedly aided the audiologist few would suggest that even the latest tests are perfectly reliable or valid, particularly with certain difficult types of cases. A possible reason for the inadequacies of the existing word and sentence tests may be their incomplete rationalization. The tester is employing complex stimuli with whose variable functions he is only partly acquainted. Another reason may be some over-concern with 'face' validity—the desire to use speech to test hearing for speech—to the possible disadvantage of test reliability.

If a speech hearing test could be constructed which would be easy to administer and to control with respect to intensity, frequency, and duration, which would eliminate the semantic factor, and which would still be a reliable predictive tool, it should represent a considerable step forward in hearing test construction.

Isolated phonemic units may provide test stimuli which would fulfill at least some of these requirements. Such stimuli might have advantages over nonsense syllables because of the ease of standardization, definition, and administration. Sustained vowels suggest themselves as possible material, such stimuli being easily produced and administered and relatively more easily controlled with respect to frequency, intensity, and duration. At the same time sustained vowels are 'speech stimuli.'

Accordingly, there is reported here an exploratory investigation into the usefulness of recorded sustained vowels as stimulus material for the testing of hearing. The report limits itself to an attempt to get answers to the following preliminary questions:

1. Can recorded tape loops be used to obtain sustained vowels which are constant enough for reliable threshold measurement?
2. Are different vowels, monitored to the same VU level, heard with equal loudness (as defined by a threshold measure), or does loudness vary significantly as a result of changes in vowel quality?
3. What is the reliability of threshold judgements of sustained vowels where the psychophysical method of limits is employed? Is this within accepted limits for clinical audiometric practice?

Procedure

Nine vowels [i ɪ ɛ ʌ ɝ æ ɑ ʊ u] were recorded by the author on a Presto RC 10/24 tape recorder at 15 inches per second tape speed. Microphone and speaker were in a sound proofed room while recording equipment was located in an adjoining

William R. Tiffany (Ph.D., Iowa, 1951) is Assistant Professor of Speech, University of Washington.

room. The vowels were produced at a constant zero VU reading with a relatively constant lip-to-microphone distance. All vowels were produced at a monopitch, each at the same pitch level. Several sustained phonations of each vowel were recorded, each about five seconds in length. All vowel qualities were speaker-determined, but it was the unanimous opinion of three other sophisticated listeners that the vowels accepted as test material were adequate examples of the General American phonemes they were intended to exemplify.

Following the recording of the several examples of the nine vowels one of each was selected for constancy of pitch level, intensity level, and vowel quality. From the midportions of these tape recordings three sections approximately 24 inches long were cut. The ends of each of these were spliced with a diagonal splice (of 45°) so as to construct three sets of nine tape loops. Sets one and three were used as experimental tapes while set two was used for practice.

Although to the ear there was no discernable difference between tape loops one and three for any of the vowels, the two different loops were used in order to explore the variable of splice location.

Ten listeners were selected from among the seniors, graduate students and faculty of the Speech Department of the University of Washington. They were chosen on the basis of avaliability and freedom from ear pathology and obvious symptoms of hearing loss. Each reported that previous audiometric testing had found him to have 'normal hearing.'

The equipment employed for the threshold measurements included the same Presto recorder used in the recording. The output of this tape recorder was monitored to zero VU and fed into a custom built power amplifier and attenuator system used in the University of Washington Speech Clinic for routine speech threshold testing. The output of the amplifier was fixed at a level approximately 13 db above average normal threshold for spondee test words and was led to an external two db per step variable attenuator controlled by an experimenter in the same room with the listener. The output of the final attenuator was led to a PDR-10 headphone in a headband with one dummy phone. The subject was provided with a signal light switch to indicate his judgement.

During playback every effort was made to obtain constant output level as measured by the VU meter on the recorder. Relative VU readings for the various vowels were also taken on the output side of the speech amplifier. The relative levels for the various vowels were found to have shifted slightly (A maximum difference of 1.1 db was found) and the appropriate corrections were made for the final threshold scores.

Because the recording machine potentiometer is calibrated in steps of two db it was not possible to obtain exact zero VU settings on output. Thus, these differences were also applied as correction factors (usually less than one VU) to the final threshold scores.

In the threshold testing the psychophysical method of limits was employed with testing proceeding as follows: The subject was instructed as to the purpose of the tests and was told that he would hear a continuous faint vowel tone. This tone was then alternately increased and decreased in intensity from points below his threshold and from various points above his

TABLE 1. Attenuation in decibels required to reach threshold, for each vowel separately, averaged over all subjects.

	ɪ	ʊ	u	ɛ	ɝ	i	ɑ	æ	ʌ
Trial 1	22.0	22.8	18.1	22.9	23.6	16.4	26.8	25.3	24.5
Trial 2	22.8	23.4	18.9	22.6	23.1	17.8	27.3	26.5	25.3
Mean	22.4	23.1	18.5	22.8	23.4	17.1	27.1	25.9	24.9
Diff.	0.8	0.6	0.8	−0.3	−0.5	1.4	0.5	1.2	0.8

threshold. In each case the above threshold points were sufficiently loud to be readily detected. In each case, also, the listener was reminded whether the change was to be an increase or a decrease. The subject was asked to press the signal button as soon as he heard the sound and to release it when he felt the sound was no longer audible. In no case was a vowel presented at a level higher than 13 db above a normal average spondee threshold. The subject was carefully instructed to judge detectability rather than recognition as five ascending and five descending thresholds were obtained for each vowel. A short practice period preceeded each judging session. In about a week's time a retest was made for each subject.

Results

Table 1 presents a summary of the relative threshold scores obtained for each vowel and trial. These scores were obtained by averaging the five ascending and five descending scores for the combined group of 10 listeners. It will be noted that average threshold scores present a range of 10 db despite the fact that recording and playback level for all vowels was held as nearly constant as monitoring with a VU meter would permit. The mean attenuation required to reach threshold averaged over all vowels and conditions was 22.8 db, roughly 10 db below threshold of recognition for spondees.

Table 1 also illustrates the small differences between Trial 1 and Trial 2. The greatest difference is seen to be 1.4 db with a mean difference of only .59 db.

In order to test the significance of the differences in results attributable to the various trials and vowels, an analysis of variance was made and appropriate *F* tests were applied. The results of this analysis, presented in Table 2, show that the differences between Trials 1 and 2 were not significant but that the differences among

TABLE 2. Analysis of variance attributable to vowels, trials, and subjects for the threshold measures represented by an average of 10 ascending and descending trials.

Source of Variation	*df*	*Mean Square*	*F*
Trials	1	14.85	2.02*
Vowels	8	209.04	36.67†
Subjects	9	148.87	
T × V	8	2.04	
S × V	72	5.70	
S × T	9	7.34	
S × T × V	72	3.55	
Total	179		

*$F = MS_t / MS_{s \times t}$ (not significant)

†$F = MS_v / MS_{s \times v}$ (significant beyond 1 per cent level)

TABLE 3. Relationships between threshold values and some measures of sound power and frequency.

Vowel	(1) Threshold	(2) Peak Power	(3) Mean Power	(4) cps from 1000 cycles
i	17.1	402	484	625
u	18.5	344	532	800
ɪ	22.4	688	346	550
ɛ	22.8	975	664	450
ʊ	23.1	688		525
ʌ	24.9	688	616	300
æ	25.9	2170	366	250
ɑ	27.1	1430	1380	175

vowels were significant at better than the one per cent level of confidence.

For interpreting the significance of the differences between individual vowel means the standard error based upon the Subjects by Vowels interaction mean square was used. This was found to be 1.068 db. Thus, a difference of 2.14 db between vowels was required for significance at the five per cent level of confidence, a 2.83 db difference at the one per cent level. With the use of such confidence limits the differences among the individual vowel means can be assessed. It will be noted that [i] and [u] stand out at the low end of the scale as being decidedly different from the other vowels.

Table 3 presents data gathered in order to obtain some hint as to the nature of the vowel differences involved. Correlation coefficients were calculated between vowel thresholds and the peak and mean power values for the vowels given by Sacia and Beck (*4*, Table V, p. 401). A correlation coefficient was also run between threshold values and a score which constituted a rough measure of the distance between the major vowel formant regions and the area of maximum sensitivity of the ear. To obtain such a measure each low frequency formant location was subtracted from 1000 cycles. Then each high frequency formant location below 1000 cycles was also subtracted from 1000 cycles and these figures were added. Inasmuch as the sensitivity of the ear for tones between 1000 and 3000 cycles can be considered roughly equivalent, second formants above 1000 cycles were not subtracted. The choice of precise cut-off points in this instance was a priori and arbitrary. The data were obtained from the 'characteristic frequencies' given by Fletcher (*3*, p. 58).

The measures of relationship which resulted from the above were: (1) mean power was correlated with threshold .47—not significant; (2) peak power was correlated with threshold .75—significant at the five per cent level; while (3) measures of formant location correlated .92—significant beyond the one per cent level.

The expectation that ascending and descending limits would show divergent threshold values was not borne

TABLE 4. Comparisons between mean ascending and mean descending threshold scores.

	ɪ	ʊ	u	ɛ	ɝ	i	ɑ	æ	ʌ
Ascending	22.9	23.9	18.5	23.3	23.5	16.7	26.0	24.4	25.0
Descending	22.9	23.7	19.3	22.7	23.8	17.8	25.9	24.2	24.2
Difference	0.0	0.2	−0.8	0.5	−0.3	−1.1	0.1	0.2	0.8

out in practice as Table 4 shows. This table presents the average threshold scores (the mean over five trials and 10 subjects) separately for ascending and descending tests and gives the differences found.[1] The exceedingly small mean difference of .04 db was less than its own standard error and therefore not significant.

One illustration of the reliability of the sustained vowel test can be obtained by comparing ascending and descending scores for each trial, vowel, and subject separately. When this is done the standard deviation of the difference scores is found to be 1.86 db. Only three of the 180 ascending-descending pairs varied by more than 5 db, only six by more than 4 db. The standard error calculated from such data is .14 db.

Additional analyses have been run to determine the effects of experimenter error and location of tape splice. For three of the subjects tested two different experimenters were used for the two trials. The average threshold value obtained by Experimenter 1 was 22.75. The average score obtained by the second experimenter was 23.22. For the remainder of the subjects five were tested by the first experimenter and two by the second. The over-all average for Experimenter 1 was 22.79 db. For Experimenter 2 and score was 22.77 db.

Although no attempt was made to include the tape splice variable in the factorial design, the random assignment of the two different tape loops makes possible a rough estimate of the splice effect, with subject and order interactions uncontrolled. For each vowel tape separate thresholds for each loop were calculated. The mean difference was found to be .46 db with a standard error of .37 db. Thus, the data as analyzed give no basis for rejecting the null hypothesis.

[1]The scores have not been corrected for VU meter position. Such corrections will not influence difference scores.

Conclusions

It would appear from these results that recorded sustained vowels constitute a reliable testing stimuli. Random errors of measurement appear to be very low and well within the limits generally acceptable in clinical audiometry. The standard error found in the present instance was somewhat less than .6 db for five ascending and five descending measures on 10 subjects.

The use of a tape splice does not appear to contribute a loss of reliability in such testing and with the method employed the experimenter and learning errors do not appear significant. The results have shown that either ascending or descending thresholds may be employed with equally useful results. Certainly the alternate ascending and descending technique used is clinically satisfactory with respect to reliability.

To some extent the present findings with regard to vowel threshold differences support the findings of Curry (2) who investigated the thresholds of vowels in a [t]-[p] environment and found that 'statistically significant differences occurred in the intensity necessary to produce identification thresholds . . .' Curry concluded that

> . . . some factor, unique to each vowel, in addition to intensity makes the identification of each vowel possible. Because of the increasing use of tests of speech reception in which vowels of equal intensity are used, the implications of this study should certainly be explored further.

Although Curry felt that his threshold differences could not be explained

on the basis of the differences in formant position of his vowels, the present study makes such an explanation appear entirely possible. The correlation between formant position and threshold of .92, while it does not explain the causal relationships involved, appears unlikely to be the result of chance alone.

The data would appear to allow some tentative conclusions with respect to the comparative action of the VU meter and the ear in monitoring continuous vowel sounds. It should be emphasized that what the VU meter does is to read rms or average voltage or something between the two (*1*), in effect giving a reading proportional to a kind of average sound pressure in the speech. Hence, the vowels were more nearly equated for mean power than for peak power. Inasmuch as vowels monitored to identical VU levels have significantly different auditory thresholds, however, it is apparent that this kind of averaging is not precisely proportional to that performed by the ear as the listener makes threshold judgments. Judging from the low correlations between threshold and mean power and the significant correlations with peak power, one possible conclusion is that peak factor makes a real difference in the threshold judgments of vowels. For this particular kind of measurement it may be that a peak reading meter may be found more useful in speech monitoring where comparisons are to be made among sounds which differ markedly in peak factors.

By way of conclusion there should be emphasized the things the present study did not do:

1. It did not provide any basis for generalizing among speakers. A question for future study regards the manner in which threshold varies from speaker to speaker with the same phonemes.

2. It did not investigate the threshold of recognition. Comparisons between the thresholds of recognition and detectability may be particularly revealing with regard to the usefulness and meaning of the sustained vowel test as a measure of hearing.

3. The present study provided no validating information. The next step in the study will be to determine how such threshold scores relate to other commonly applied threshold measures. The results of such tests with cases of perception and conduction deafness should be of particular interest.

4. This study did not provide threshold information on phonemes other than the vowels. Separate determination of detectability and recognition thresholds for vowels, voiced and unvoiced continuant consonants, and voiced and unvoiced stop consonants may provide a firmer basis for the design and rationalization of clinically useful speech hearing tests.

Summary

In a preliminary exploration of the thresholds of recorded sustained vowels continuous tape loops of nine General American vowels were presented to 10 normal hearing listeners to obtain a threshold of detectability. The psychophysical method of limits was employed to obtain separate ascending and descending thresholds. The experiment was designed to yield information with regard to the reliability of such a testing procedure, the extent to which learning, recording, and experimenter error played a part, and to determine whether significant threshold differences would be found among vowels monitored to a constant VU level. The following results were obtained:

1. Despite the fact that level remained constant with respect to VU meter reading, significant differences in thresholds were found among the vowels tested.

2. There was a high correlation between vowel threshold and formant location (r=.92) and a moderate but significant correlation between vowel threshold and peak power (r=.75).

3. Variation resulting from learning, random error, experimenter error, recording error, and errors of habituation and expectation appeared to be very slight.

It was concluded that tape recorded sustained vowel loops constitute reliable testing stimuli under the conditions employed in this experiment.

Suggestions for further study include the use of additional speakers, the comparisons between thresholds of detectability and recognition, the comparison with other types of speech hearing tests, and the employment of various types of consonants in similar tests of the thresholds of isolated phonemic units.

References

1. Beranek, L. L. *Acoustic Measurements.* New York: John Wiley, 1949.
2. Curry, E. T. An experimental study of the relative identification thresholds of nine American vowels. *Speech Monogr.*, 17, 1950, 90-94.
3. Fletcher, H. *Speech and Hearing.* New York: D. Van Nostrand, 1929.
4. Sacia, C. F. and Beck, C. J. The power of fundamental speech sounds. *Bell Syst. tech. J.*, 5, 1926, 393-403.

Adaptation To Delayed Side-tone

Chester J. Atkinson

BY THE TIME a person has attained adulthood, his speech may be considered a stable function. A proficiency in articulation, a general level of intensity and a rate of speech have been established. Loudness and rate of speech have reached a working equilibrium with level of aspiration. Speech in a normal adult may be said to have attained a state of behavioral homeostasis.

The ear as a monitoring system for the control of the output of the speech mechanism is demonstrable in several details. For example, speech is louder in noisy surroundings, not as loud in quiet surroundings; speech in reverberant rooms is slower and louder than average (*1*). This latter finding led to experiments in which the side-tone of a speaker was delayed in time until the experience was comparable to speaking in a room that had a strong single echo (*2*). The delay between the instant of speech and the arrival of the side-tone at the ear was accomplished by the Audio Signal Delaying Unit (*3*).

Behavior when delayed side-tone is present may be an indication of the upset of the normal order of events in the input of the proprioceptive aspects of speech and the monitoring function of the ear (*5*). If this is true, then the behavior evidenced under a condition of delayed side-tone may be an attempt to return speech to a condition that would produce normal side-tone. This striving toward normality is in line with the observation that people do control the changes, especially the extremes, that occur in their behavior in what might be called a tendency toward behavioral homeostasis.

Persons experiencing delayed side-tone generally exhibit one or more of the following reactions: The voice becomes louder; words, syllables, or phonemes are repeated; words are mispronounced; the speech rate becomes slower; the face becomes red; and the palms perspire. The empathic feeling of an observer is that the speaker experiencing delayed side-tone is struggling.

To an observer this behavior appears to become a less intense struggle after the exposure to delayed side-tone has been prolonged over a period of time. The lessening of the struggle appears to begin within two to three minutes after the onset of reading against delay. Individuals who have experienced delayed side-tone indicate in interviews that speaking gradually became easier. That is, practice over a period of time seemed to make it easier to talk with delayed side-tone present. These reports, as well as these observations of behavior, led to the belief that some adaptation or increased ability to withstand the disruptive effect of the delay of the side-tone upon the sound pressure

Chester J. Atkinson (Ph.D., Ohio State, 1950) is Supervisor of Side-tone Project, State University of Iowa. This study was completed at the Acoustic Laboratory, U. S. Naval School of Aviation Medicine, Pensacola, Florida.

level and duration of short samples of speech was demonstrated. That is, both speakers and listeners gained the impression that the speakers learned to make their speech with delayed side-tone more normal if sufficient practice were afforded.

The objective of the present study was to chart the duration and sound pressure level over a fairly long period of time of readings of short phrases during which the speakers were confronted with a delay in airborne side-tone. The study was undertaken in an effort to establish tentative norms for the adaptation rates of sound pressure level and duration of speech during delayed side-tone.

Procedure

A useful listing of phrases in groups of five has been made by Walker and Black (*4*). They have collected a table in which groups of phrases are equated in natural duration and sound pressure level to every other group in the same table. The 15 groups of phrases used were randomly selected from this table.

One subject at a time was taken into an 8′ × 19′ × 10′ sound-treated room and was seated in a chair with a headrest so that his lips were six inches from an Altec condenser microphone. He was given 15 cards, each containing five phrases, and told to read one of the five phrases on a card as each five seconds was indicated on an electrick clock. The cards were read serially and in the same order by all speakers. Each subject was told that for the first three cards (first 15 phrases), he would hear himself with normal side-tone. He was told that beginning with the fourth card, his side-tone would be delayed by part of a second, and would remain delayed while he read the rest of the cards, and that this delay had a tendency to make people change their speech. The speaker was told that he should speak as naturally as he could. The final instructions were, 'Read the first 15 phrases naturally and continue to read the rest of the phrases as naturally as you can.'

The microphone led to an Audio Signal Delaying Unit and to an H.P.L. Recorder (Sound Apparatus Co., 50 db potentiometer, 50 mm/second). The side-tone signal could be routed through a circuit with no delay or through the delaying unit. In either case the side-tone was returned through a limiter (Langevin) so that the sound pressure level of the side-tone remained essentially constant at the speaker's earphones. This level was standard inter-com level for military aircraft.

After the first 15 phrases (reading periods one, two, and three; the five phrases on a card constituting a reading period) were completed, during the first 75 seconds of the experiment, one of the delay times was introduced into the side-tone of the speaker. This delay remained constant while the speaker read the remaining 60 phrases (reading periods four to fifteen). This part of the task required 300 seconds. No reader was used more than once; none had previously experienced delayed side-tone. Twenty male subjects read at each of the 10 delay times, which were .03, .06, .09, .12, .15, .18, .21, .24, .27, and .30 seconds.

All measurements for the study were taken from the record made by the H.P.L. Recorder. Each sound pressure level value entered in an analysis matrix was an average determined for each group of five phrases (one reading period) by summing the readings of the three highest peaks per phrase

TABLE 1. Results of analyses of measures of speech during normal and delayed side-tone.

Delay time	*Sound pressure level (F)*	*Duration (F)*
.03	5.27*	3.84*
.06	18.02*	23.87*
.09	49.11*	23.50*
.12	32.55*	23.71*
.15	43.96*	17.49*
.18	25.35*	13.16*
.21	9.36*	7.12*
.24	32.99*	7.06*
.27	61.05*	8.90*
.30	50.54*	4.56*

*Significant at the 1% level (2.17, 14 and 266 degrees of freedom).

and averaging the 15 peaks. Each value of duration that was entered in an analysis was an average of the measurements in millimeters of the durations of the five phrases in a reading period.

Results

The data were treated by analysis of variance. The general design can be described as a *reading periods* by *subjects* analysis for each delay time studied. There were 15 reading periods and 20 subjects in each of the analyses reported in Table 1. The number of reading periods was reduced to 12 in the analyses reported in Table 2.

The results of tests for significance of the differences in the sound pressure level of the responses at the various reading periods are given in the first column of Table 1. Each of these analyses yielded F ratios significant beyond the one per cent level of confidence. The mean values for the various delay times are portrayed graphically in Figure 1.

The means of the measures of sound pressure level of the responses to reading periods one, two, and three, were lower than the measures of the later reading periods. These results are in line with previous research by Black (2) where significant sound pressure level differences were found between conditions of no delay and any delay of .03 second up to .30 second.

Means of the measures of duration of the responses to each of the delay times are portrayed graphically in Figure 2. Tests of the significance of the differences among these means yielded variance ratios which in each case were significant beyond the one per cent level of confidence as shown in the second (duration) column of Table 1. These results are also in line with the previous research mentioned above.

Table 1 shows the results of analyses involving the measures of the sound pressure level and duration of speech when the side-tone was not delayed, reading periods one, two, and three,

TABLE 2. Results of analyses of measures of speech during delayed side-tone.

Delay time	*Sound pressure level (F)*	*Duration (F)*
.03	1.83*	3.94**
.06	3.77**	5.08**
.09	10.81**	3.33**
.12	2.66**	1.54
.15	9.33**	2.40**
.18	2.31*	0.46
.21	3.57**	3.46**
.24	3.32**	1.63
.27	5.77**	3.13**
.30	6.13**	0.75

*Significant at the 5% level (1.83, 11 and 209 degrees of freedom).

**Significant at the 1% level (2.34, 11 and 209 degrees of freedom).

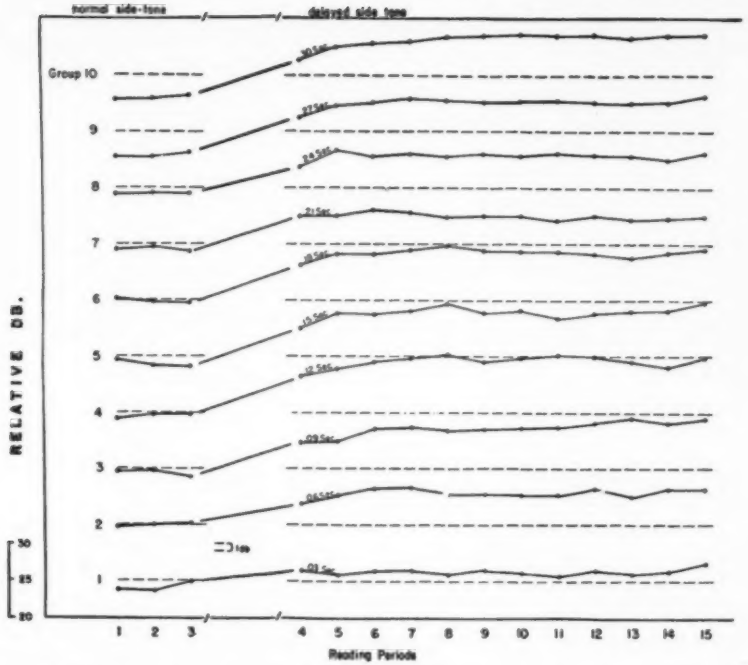

FIGURE 1. The mean sound pressure level in db of the responses in each reading period. The ordinate for the curve representing each different group is shown separately to avoid overlapping of the curves. The dotted line represents the 25 db level for each group.

as well as speech during delayed side-tone, reading periods four through fifteen. Beginning with reading period four, the situation changed from a normal status to a very abnormal one. Since these differences between the normal condition of no delay and the abnormal condition of delayed side-tone enter into the *F* ratios of Table 1, it was decided that no interpretations of the significance of various amounts of delay would be based on the variance ratios obtained when the measures taken during normal side-tone were included.

Therefore, analyses were made of the measures of the intensity of only those responses made during reading periods four to fifteen, each analysis corresponding to one of the 10 delay times. Of these analyses, eight showed significance at the one per cent level of confidence as shown in the first (sound pressure level) column of Table 2.

Ten analyses were made of the measures of the duration of the responses made during the reading periods four to fifteen, corresponding to each of the 10 delay times. Of these analyses, six proved to be significant at the one per cent level of confidence as shown in the second (duration) column of Table 2.

The first impression might be that because of the significant variance

ratios there was adaptation and a return toward normal sound pressure level and duration. Inspection of Figure 1 discloses, however, that the sound pressure level means that appear to differ considerably from the majority of the mean value are those of the early reading periods which are *lower* than the level reached during the later reading periods. The same generalization does not hold for the duration measures, as is evident in Figure 2. The data of this study indicate, therefore, that, if there is a difference in the sound pressure level of a phrase corresponding to the length of time a speaker has been exposed to delayed side-tone, that difference is expressed in a gradual increase in sound pressure level in the first few phrases. The implication is clear, then, that there was no adaptation demonstrated in this study.

The statement indicating no adaptation must be construed as tenable only for the reading periods and speaking conditions studied. Observation of the means of .03 second delay for duration suggests that if the number of reading periods had been continued to perhaps 20 or 25 some adaptation might have become evident. One study is planned

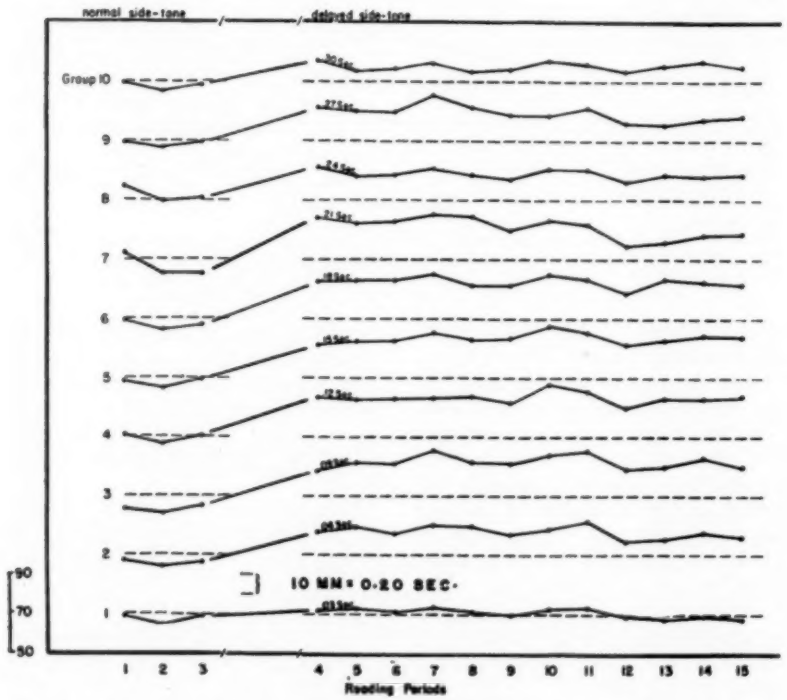

FIGURE 2. The mean duration of phrases in millimeters for each reading period. The ordinate for the curve representing each different group is shown separately to avoid overlapping of the curves. The dotted line represents the 70 mm level for each group.

to increase the reading periods with delayed side-tone; another to have reading performed under different conditions of timing.

It can be observed in Figure 2 that some reading periods, notably number seven, were rather consistently above the general average of duration. The same can be noted in Figure 1 for the sound pressure level of reading period eight. It will be remembered that the groups of phrases had been pronounced equal in duration and sound pressure level. This pronouncement was based upon normal side-tone. It could not be foreseen that phrases might have more or less intrinsic duration or sound pressure level under delayed side-tone. Therefore, the apparent differences that occur in reading period seven may be an artifact due either to order effect or to the possibility that delayed side-tone may affect the duration and sound pressure level of a given phrase more than another. These differences may be the factor that operated to give significant *F* ratios among a group of means that are so nearly like their general mean.

Conclusions

1. Speakers appear to read phrases louder and slower when their side-tone is delayed.

2. This study did not demonstrate adaptation to delayed side-tone in either the sound pressure level or duration of speech during the time limits imposed by the study. This is true of all the delay times utilized.

3. A speaker may tend to speak louder as he reads for approximately the first 75 seconds after the introduction of a delay into his side-tone.

4. While no adaptation is demonstrated in either the duration or sound pressure level of speech, there is some evidence that perhaps longer reading time might show significance in these aspects.

5. The results cited in the study do not rule out adaptation in qualities not measured, such as perspiring palms, breath control, quality of speech, or repetitions and mispronunciations of words. The same can be said for other reading or speaking situations, other timing methods, or other side-tone levels.

References

1. Black, J. W. The effect of room characteristics upon vocal intensity and rate. *J. acoust. Soc. Amer.*, 21, 1950, 174-176.
2. ———. The effect of delayed side-tone upon vocal rate and intensity. *JSHD*, 16, 1951, 56-60.
3. Marple, N. and Morrill, S. A device for the production of delayed side-tone. U. S. Naval School of Aviation Medicine, Pensacola, Fla., 1951. Jt. proj. rept. no. 4, Bur. med. res. proj. no. NM 001 064.01.08.
4. Walker, C. and Black, J. W. The intrinsic intensity of oral phrases. U. S. Naval School of Aviation Medicine, Pensacola, Fla., 1950. Jt. proj. rept. no. 2, Bur. med. res. proj. no. NM 001 064.01.02.
5. Wiener, N. *Cybernetics*. New York: John Wiley, 1948.

Letter To The Editor

SIR:

The review of the textbook, *Speech Improvement,* by Letitia Raubicheck, that appeared in the March, 1953, issue of *JSHD* seemed to deal exclusively with what the reviewer did *not* like about the book, rather than to describe and evaluate it in relation to its purpose, scope, and usefulness. I would appreciate it if you would publish this as a supplement to the review.

The author states that she wrote this text to meet the needs of high school students in the special speech classes in the schools and universities and those children in speech rehabilitation clinics in hospitals.

The book is divided into six parts. In part one there is a discussion of the elements of good speech as well as a simplified version of the anatomy and physiology of speech. There follows a diagnostic test for all English sounds, and tongue and ear training exercises for articulatory difficulties.

The other parts are concerned with specific goals and a progressive sequence of units for the problems of lisping, production of 'l' and 'r,' foreign accent, voice problems and stuttering. The units contain practice words, phrases and sentences, as well as reading selections and quiz games. The author states that the order in which the exercises appear is 'not sacred.' She recommends that teachers use the units in accordance with pupils' needs.

In the section on foreign accent, the usual substitutions for English sounds made by people of various nationalities are noted. Strong and weak forms, assimilation and intonation are clearly explained. There are also practice situations concerned with the pupil's relations to others in school and in the community.

In the section on stuttering, in addition to the exercises, the pupil is guided in considering his health habits, leisure time activities and study habits. A vocational aptitude check sheet is included and seven units are concerned with functional situations for the pupils to attempt.

The book is written as if the author were speaking directly to the pupil; its vivid and informal style will appeal to high school students. The material is on the adolescent level and the quiz games, especially, will be enjoyed by teen-agers.

An attribute of the book is that the text is planned for use by groups of pupils, although students may also work on the units alone, if necessary.

The author refers to, but has not attempted to include, material relating to the psychological aspects of speech therapy. It has been left to the individual therapist to abstract from the text the items he finds of value to his own students for the improvement of the mechanics of speech production, and to supplement whatever scientific information and methodology suits his own philosophy.

The section on foreign accent will be valuable to teachers who have pupils of foreign origin. The book will also be useful to classroom teachers who have some speech background and to teachers of general speech, as supplementary material for speech improvement.

ZELDA HORNER KOSH
Arlington Co., Va., Public Schools

Book Reviews

BAKER, HARRY J. *Introduction to Exceptional Children.* (Rev. ed.) New York: The Macmillan Co., 1953. Pp. 500. $5.00.

This is a revision of the 1944 edition. It is a comprehensive treatment of the whole field of special education. It examines all aspects of exceptional children: vision, hearing, speech, crippled conditions, neurological and psychogenic disorders, behavior problems, and the educational problems of the gifted child. Speech disorders are presented in a chapter which is brief, but authentic and concise. Other problems are handled more or less comprehensively in terms of diagnosis, causes, remedies, prevention, history of development and educational aspects.

The author's language is largely nontechnical. The book is obviously designed as a text for survey courses in special education. Since so many speech disorders are associated with other handicaps there is much information condensed in this book which will enrich the background of the speech teacher and the therapist. Fairly accurate and recent statistics on the incidence of all handicapping conditions and extensive bibliographies are included, thereby extending the usefulness of this work as a reference book for all those working in special education.

MARY HUBER.

Los Angeles State College

KELLY, J. C. *Clinician's Handbook for Auditory Training.* Dubuque, Iowa: William C. Brown Co., 1953. Pp. 155. $2.00.

This booklet is a collection of exercise material for the auditory training of hard of hearing children and adults. It is designed primarily for the professionally trained hearing therapist to be used with older children and adults. The author suggests that the exercises should not be used with children younger than 10 without considerable modification of content.

The author's term, 'hard of hearing children,' refers to those children with impaired hearing who are able to remain in a normal classroom in a regular school and compete with children who can hear and talk. The preface of the booklet points out the differences in educational needs of hearing handicapped children attending a normal school, in contrast to full-time instruction for deaf children in a special school or classroom.

In the introductory chapters the listening act and adaptation to amplification are briefly discussed. There is also a chapter on evaluating speech-hearing. A method whereby the regular classroom teacher may help in locating hard of hearing children is suggested. Definite directions and 20 Alphabet Syllable Diagnostic Lists are given for administering this plan. It is not a test, but a technique by which a classroom teacher may screen a class of older children in groups of 10 or less. The follow-up work is done by those who are competent to do it.

The main part of the booklet is devoted to auditory training exercises or drills. There are seven types of lessons, each lesson becoming progressively more difficult.

The beginning drill uses numbers as the easiest form of communication. Only 10 numbers are used, zero to nine. The first exercise in Lesson I is a series of only two numbers. The numbers are read with a carrier phrase as *Number one is two five. Number two is three six.* The second exercise employs three numbers in a series, the third exercise four numbers. List No. 4 adds an alphabet letter to the number series as 23K. Lesson I sets the pattern for the following lessons, and the same pattern is used throughout the booklet. In each lesson the number of heard items is increased from one to four.

While the number exercises stress vowel discrimination, the second step stresses consonant discrimination through alphabet letter drills. The author states that the alphabet letters were used because they include virtually all of the consonant sounds of English speech, and most children over 10 years of age know the alphabet and can easily write or say it.

Lessons III through VI are on words out of context. The pattern is that of the multiple word presentation as used in the Waco

Book Reviews is edited by Kenneth Scott Wood, University of Oregon.

24-word intelligibility test and the Navy Pensacola speech intelligibility test. Most of these exercises involve consonant discrimination, except Lesson VI, which is vowel discrimination for the most part.

Lesson VII, the final lesson in the sequence in this booklet, presents connected speech where context is a factor in listening. The major part of the booklet, however, is devoted to consonant discrimination.

This plan of study for auditory training provides a series of communication exercises of progressive difficulty, which leads to greater attention in listening, improved discrimination for the sounds of speech, and improved auditory memory span. The materials in the exercises should be most helpful to a public school hearing therapist. The therapist would need to devise methods of motivation when using it with children, however, as the similarity of the materials throughout all the lessons may become monotonous.

IRENE E. KELLY.
Seattle Public Schools

GRIFFITHS, WILLIAM. *Behavior Difficulties of Children as Perceived and Judged by Parents, Teachers, and Children Themselves.* Minneapolis: University of Minnesota Press, 1952. Pp. 116. $3.00

This is a report of a study made to find out what kinds of behavior problems children think they have. The difficulties reported by children are compared with those reported by their parents and their teachers. Interviews and questionnaires were used to discover aggressive, delinquent-related, withdrawing, and noncompliant behavior in 900 children from six to 14 years of age. The study also investigated the relationship between behavior difficulties and the family's socio-economic status.

The author concludes that children even in the early elementary school period have a fairly good realization of what their parents and teachers believe to be their behavior problems, but at this age the child's conception of better behavior is practically synonomous with obedience to adults. Conclusions are given concerning sex differences, age differences, and socio-economic differences for each type of behavior difficulty studied.

HAMMOND, KENNETH R. AND ALLEN, JEREMIAH, JR. *Writing Clinical Reports.* New York: Prentice-Hall, Inc., 1953. Pp. 235. $4.00.

This book aims to help the psychologist write a better clinical report. The authors state that the opinions of qualified observers indicate that the performance of the average clinical psychologist is usually impaired by the fact that he finds the task of report writing unfamiliar, difficult, and sometimes distasteful.

The authors discuss the functions of the report, adaptation of reports to various kinds of readers, the organization of the report, its accuracy and integration, its readability and tone, vocabulary, and checking and revising the report.

An appendix of 46 pages discusses organization and printed forms for reporting the results of psychological testing. Several sample outlines and forms are given in addition to a number of sample reports.

DINSMORE, ANNETTE B. *Methods of Communication with Deaf-Blind People.* New York: American Foundation for the Blind, 1953. Pp. 26. $0.35.

The author explains the various methods used to communicate with those who are both blind and deaf. The methods are divided into two groups: Those which require learning of the speaker as well as on the part of the deaf-blind person, and those methods which require learning only for the deaf-blind person.

The methods in the first group include the one-hand and two-hand manual alphabet, the English two-hand alphabet, the American Morse code, the Cross code, Braille hand speech, Braille, and the sign language of the deaf. In the second group are included explanations of the alphabet glove, printing in the palm, the alphabet card, the vibration method, and mechanical devices.

RAND, WINIFRED, SWEENY, MARY E. AND VINCENT, E. LEE. *Growth and Development of the Young Child.* (5th ed.) Philadelphia: W. B. Saunders Co., 1953. Pp. 523. $4.50.

This is another revision of a text book first published in 1930. The organization of the book has not been changed substantially, although some of the content has been rearranged and expanded.

Twenty-one pages are given to a section on language development as part of the

chapter: *Intellectual Development.* The authors outline the causes of language retardation and treat in six paragraphs the problem of stuttering.

Chapter divisions include the headings: *Current Concepts in Child Development; Home and Family as a Background for Growth; The Child's Physical Equipment for Growth, Development, and Functioning; Meeting Physical Needs; Motor Growth; Intellectual Growth; Emotional, Social, and Spiritual Growth;* and *Philosophy of Adult-Child Relationships.*

Approximately 200 pages deal with physical aspects of child development. A list of 21 films is given in addition to a bibliography of 670 entries.

STRANG, RUTH. *The Role of the Teacher in Personnel Work.* (4th ed.) New York: Bureau of Publications, Columbia University, 1953. Pp. 491. $3.75.

This work of 13 chapters on child guidance aims to give teachers insight and technical skill in performing guidance roles as classroom teachers, advisors, club sponsors, and as counselors. Some of the material relates to the problems of cooperation with administrators, specialists, and community agencies.

One chapter is devoted to psychological tests, another to interviewing techniques, and a third to developmental records.

BUROS, OSCAR K., ed. *The Fourth Mental Measurements Yearbook.* Highland Park, N. J.: The Gryphon Press, 1953. Pp. 1163. $18.00.

This volume is the seventh in a series of publications designed to assist test users in education, industry, psychiatry, and psychology to locate and to evaluate tests and books on testing. It covers the period 1948 through 1951.

The section, *Tests and Reviews,* lists 793 tests, 596 original test reviews by 308 reviewers, 53 excerpts from test reviews in 15 journals, and 4,417 references on the construction, validity, use, and limitations of specific tests.

The section, *Books and Reviews,* lists 429 books on measurements and closely related fields and 758 excerpts from book reviews in 121 journals.

A periodical directory and index and a publishers directory and index are given in addition to an index of test titles, an index of names, and a classified index of tests.

CUTTS, NORMA E. AND MOSELEY, NICHOLAS. *Better Home Discipline.* New York: Appleton-Century-Crofts, Inc., 1952. Pp. 314. $3.50.

This is based on materials collected from more than 6,000 families. The materials include accounts of children's misbehavior, the means parents used to correct it, and how parents use praise, play, and fun in bringing up their children. Some of the reports are verbatim from the experiences of families.

The book is a survey of home discipline written up as a practical guide for parents of children from two to seventeen.

COLE, LAWRENCE E. *Human Behavior: Psychology as a Bio-Social Science.* Yonkers-on-Hudson, N. Y.: World Book Co., 1953. Pp. 884. $5.50.

This book is an overview of facts, principles, and problems in psychology. It is offered as a course in general psychology. The author draws liberally from experimental and clinical studies and brings in related materials from several areas of the humanities.

The 24 chapters are organized under seven sections with the following as topical headings: *Nature of the Psychological Problem; Growth and Development; Motivation and Affective Processes; Modification of Behavior; Attending and Perceiving; The Reasoner;* and *The Structure and Dynamics of the Self-System.* The last section, psychoanalytical in approach, is 200 pages in length.

Current Publications

ALLEN, ROBERT M. *Introduction to the Rorschach Technique: Manual of Administration and Scoring.* New York: International Universities Press, 1953. Pp. 126. $3.00.

BEAN, KENNETH L. *Construction of Educational and Personnel Tests.* New York: McGraw-Hill Book Co., 1953. Pp. 239. $4.50.

BOSSELMAN, BEULAH C. *The Troubled Mind.* New York: The Ronald Press Co., 1953. Pp. 206. $3.50.

BRAZIE, GLADYS. *Speech Practice Book: For Speech Improvement and Speech Cor-*

rection. Portland, Ore.: J. K. Gill Co., Distributor, 1953. Pp. 154. $2.50.

BUSH, GEORGE P. AND HATTERY, LOWELL H., eds. *Teamwork in Research.* Washington, D. C.: American University Press, 1953. Pp. 191. $4.00.

CROW, LESTER D. AND CROW, ALICE. *Child Psychology.* New York: Barnes and Noble, Inc., 1953. Pp. 282. $1.50.

DINSMORE, ANNETTE B. *Methods of Communication with Deaf-Blind.* New York: American Foundation for the Blind, 1953. Pp. 26. $0.35.

GOODSPEED, HELEN C. AND OTHERS. *Child Care and Guidance.* Philadelphia: J. B. Lippincott Co., 1953. Pp. 288. $4.00.

HALPERN, FLORENCE. *A Clinical Approach to Children's Rorschachs.* New York: Grune and Stratton, Inc., 1953. Pp. 270. $6.00.

HAMMOND, KENNETH R. AND ALLEN, JEREMIAH M., JR. *Writing Clinical Reports.* New York: Prentice-Hall, Inc., 1953. Pp. 247. $4.00.

HAUGEN, EINAR I. *The Norwegian Language in America: A Study in Bilingual Behavior.* (Publication of the American Institute, University of Oslo.) Philadelphia: University of Pennsylvania Press, 1953. Pp. 715. $8.00.

HECK, ARCH O. *The Education of Exceptional Children: Its Challenge to Teachers, Parents, and Laymen.* (2nd ed.) New York: McGraw-Hill Book Co., 1953. Pp. 527. $6.00.

HINSIE, LELAND E. AND SHATSKY, JACOB. *Psychiatric Dictionary with Encyclopedic Treatment of Modern Terms.* (2nd ed.) New York: Oxford University Press, 1953. Pp. 791. $15.00.

JENKS, WILLIAM F., ed. *Special Education of the Exceptional Child.* Washington, D. C.: Catholic University of America Press, 1953. Pp. 162. $2.00.

JONES, MAXWELL S. AND OTHERS. *The Therapeutic Community: A New Treatment Method in Psychiatry.* New York: Basic Books Publishing Co., 1953. Pp. 207. $3.50.

KARPOVICH, PETER V. *Physiology of Muscular Activity.* Philadelphia: W. B. Saunders Co., 1953. Pp. 340. $4.75.

KELLY, J. C. *Clinician's Handbook for Auditory Training.* Dubuque, Iowa: William C. Brown Co., 1953. Pp. 155. $2.00.

KUPPER, WILLIAM H. *Dictionary of Psychiatry and Psychology.* Paterson, N. J.: Colt Press, 1953. Pp. 194. $4.50.

MACE, CECIL A. AND VERNON, PHILIP E., eds. *Current Trends in British Psychology.* New York: British Book Centre, 1953. Pp. 270. $3.25.

MATHUR, MURLI LAL. *Stammering.* Jodhpur, India: Multan Mal 'Azad,' 1952. Pp. 36. As. 8 (approx. $0.11).

ORBAN, BALINT. *Oral Histology and Embryology.* (3rd ed.) St. Louis: C. V. Mosby Co., 1953. Pp. 364. $8.50.

PORTER, A. *Introduction to Servomechanisms.* (2nd ed.) New York: John Wiley and Sons, 1953. Pp. 182. $2.25.

RAND, WINIFRED AND OTHERS. *Growth and Development of the Young Child.* (5th ed.) Philadelphia: W. B. Saunders Co., 1953. Pp. 523. $4.50.

RICHARDSON, EDWARD G. *Sound: A Physical Text-book.* New York: Longmans, Green and Co., 1953. Pp. 359. $5.00.

RUBINSTEIN, HYMAN S. *The Study of the Brain.* New York: Grune and Stratton, Inc., 1953. Pp. 209. $9.50.

SARGENT, HELEN D. *The Insight Test: No. 10.* (Menninger Clinic Monogr.) New York: Grune and Stratton Co., 1953. Pp. 276. $6.75.

SHIPMAN, GEORGE R. *The Vowel Phonemes of Meigret.* Washington, D. C.: Georgetown University Press, 1953. Pp. 95. $2.00.

Symposium on Fatigue with Emphasis on Statistical Approach. Philadelphia: American Society for Testing Materials, 1953. (Technical Pub. No. 137) Pp. 91. $2.00.

TASAKI, ICHIJI. *Nervous Transmission.* Springfield, Ill.: Charles C. Thomas, 1953. Pp. 172. $7.50.

TOWNSEND, JOHN C. *Introduction to Experimental Method: For Psychology and the Social Sciences.* New York: McGraw-Hill Book Co., 1953. Pp. 229. $4.00.

VON FOERSTER, HEINZ AND OTHERS, eds. *Cybernetics: Circular Causal and Feedback Mechanisms in Biological and Social Systems.* (Transactions of the Ninth Conference on Cybernetics) New York: Josiah Macy, Jr. Foundation, 1953. Pp. 204. $4.00.

Abstracts

BORDLEY, J. E. ET AL. Symposium on hearing, speech and reading difficulties in children. *J. Pediat.*, 12, 1953, 81-87.

This symposium was presented at the 1952 annual meeting of the American Academy of Pediatrics in Chicago. The speakers, chaired by Dr. Bordley, discuss the problems of hearing, speech and vision as related to a child's intellectual and social development and the rehabilitation of children with these problems. The symposium stresses the aspects of importance to the pediatrician especially. (*S.O.R.*)

CABANAS, R. Generalization of the chewing method in logopedics and phoniatry. *Folio phoniatr.*, 4, 1952, 249-252.

Report of the beneficial use of Froeschel's chewing method in Havana with stuttering, motor aphasia, voice problems, hyperrhinolalias and deaf speech. (*A.J.B.*)

BRITTON, D. The rehabilitation of aphasics. *Physiother. Rev.*, 31, 1951, 477-483.

A summary of basic concepts in speech therapy for aphasics designed for physical and occupational therapists. The team approach to therapy for aphasics is stressed. Basic position is that, since a large part of the cerebral cortex is involved in the interpretation, formulation, and production of language, disturbances resulting from a cerebral lesion are rarely, if ever, confined to a single language function. A patient who presents symptoms of aphasia in his speech almost invariably shows some impairment of reading, writing, or understanding. General agreement is claimed for the basic principles that (a) new learning in aphasics requires frequent repetition; (b) a variety of new material at one time should be avoided; and (c) methods should be adapted to the individual patient. (*J.J.V.*)

DEHIRSCH, K. Specific dyslexia or strephosymbolia. *Folia phoniatr.*, 4, 1952, 231-248.

Specific dyslexia is an associative disorder and should be distinguished from a generalized learning disability. It belongs in the category of developmental language disorders, and has a significant familial element. Dyslexic children of 10 show immaturity of the nervous system and are also often hyperkinetic and distractible. Treatment aims at the reinforcement of associations. (*A.J.B.*)

Excerpta Medica, Cancer, 1, 1953, entire issue.

This is the first issue of a new monthly abstract journal covering cancer and its related fields. Special sections of the journal are devoted to Organs of Special Sense (including ear), Respiratory System (including nasal passages and larynx), and Alimentary System (including lips, mouth, and pharynx). In addition to the monthly index of authors a classified subject and author's index will be compiled annually. (*J.M.*)

REITH, A. Rolle des stylopharyngealen Muskelsystems im Krankheitsbild der Taschenbandstimme und der Dysphonia spastica. *Folia phoniatr.*, 4, 1952, 201-216.

The constriction of the false vocal cords in cases of phonation with the ventricular bands is due to the stylopharyngeal muscle system. The strict closure of the entrance of the larynx is physiologic in swallowing, vomiting and pressing for stool, and occurs also in singultus and in clearing of the

---

Abstracts is edited by Jack Matthews, University of Pittsburgh, assisted by the following committee: Asa J. Berlin, Pennsylvania State College; Virginia B. Carroll, Minneapolis Veterans Hospital; Charles F. Diehl, University of Kentucky; James V. Frick, Pennsylvania State College; Inez E. Hegarty, Mt. Holyoke College; Lester L. Hale, University of Florida; Frank M. Lassman, University of Minnesota; Georgiana M. Peacher, Temple University; Sylvia O. Richardson, San Diego, Calif.; George H. Shames, University of Pittsburgh; D. C. Spriestersbach, State University of Iowa; Jesse J. Villarreal, University of Texas. The committee systematically reviews 203 journals for articles of interest to members of ASHA.

throat. The spasmotic contraction of the ventricular bands can be seen in normal individuals laryngoscopically when the muscles of the abdomen contract. In cases of spasmotic dysphonia the muscles of the abdomen contract before phonation occurs and this leads to the spasmotic constriction of the vocal cords. Description of the treatment.' (*A.J.B.*)

Ettinger, L. Aphonia. *Acta psychiat., Kbh.*, 28, 1953, 27-34.

The author questions the label of hysterical aphonia when mutism is observed without organic findings. He cites four cases and presents the following diagnosis with each: (1) somatizing and psychogenically fixed symptoms of psychogenic origin; (2) post-traumatic neurosis; (3) post-traumatic state produced by actual paresis of one cord; (4) psychogenic continuation of an existing somatic disease. He concludes that none of these four cases could, with careful diagnosis, be regarded as hysterical, yet similar cases frequently are diagnosed as such. He suggests more careful observation of a patient's total history in view of the possibility of actual trauma to the cords occurring previous to the aphonia. (*V.B.C.*)

Deaver, G. G. and Greenpan, L. Clinical approach to the etiology of cerebral palsy. *Arch. phys. Med.*, 34, 1952, 478-485.

An analysis was made of the predisposing and prenatal factors as physiological agents in 94 cases of cerebral palsy selected at random from those treated at the Lenox Hill Preschool Cerebral Palsy Clinic. The authors concluded that rarely is only one etiological factor involved. Probable predisposing factors include prematurity, excessive birth weight, multiple pregnancies with associated prematurity, prenatal anoxia, Rh factor, and toxemia. Contrary to the views held by some maternal age, sex of the child and being first-born were not considered of etiological significance. (*S.O.R.*)

Crothers, B. and Meyer, E. Psychological and physical evaluation of patients with cerebral palsy studied for periods of ten years or more. *Amer. J. phys. Med.*, 32, 1953, 153-158.

Approximately 200 cases have been studied of a group followed by Drs. Crothers and Meyer for at least 10 years. The authors feel that their findings to date substantiate original predictions made in the majority of cases. Dramatic exceptions were found, which proved both interesting and disconcerting. In some cases there were shifts in physiological and perhaps in anatomical status. The authors suggest that if this is supported by adequate evidence, we must be prepared for arranging for periodical reviews by all possible methods and question the comfortable theory of 'fixed' lesions. Also it is pointed out that there has been insufficient investigation and examination of the sensory disorders of these children. (*S.O.R.*)

Norris, M. J. A cerebral palsy mobile unit. *Physiother. Rev.*, 33, 1953, 16-20.

Two mobile units serve two counties in northern California and provide therapy for 32 children for whom no community treatment centers are available. A description of portable equipment carried in the mobile units is presented. The present program, which emphasizes the training of mothers to provide home therapy, stresses physiotherapy; but a mobile unit for speech therapy will be added. (*J.J.V.*)

Westlake, H. Speech training for the cerebral palsied child. *Physiother. Rev.*, 32, 1952, 59-65.

The speech development of the cerebral palsied child is usually like that of a normal child, but slower. The pattern of normal speech development therefore contributes a framework for understanding the c.p.'s difficulties, and provides implications for stimulating his speech development. Detailed information is presented for evaluating the speech resources of the cerebral palsied child, and for setting up minimal goals in motor activity in speech production as a basis for muscle training. (*J.J.V.*)

Pruzansky, S. Description, classification and analysis of unoperated clefts of the lip and palate. *Amer. J. Orthodon. oral Surg.*, 39, 1953, 590-611.

'The need for an anatomically accurate means for describing clefts of the lip and palate in the newborn child was stressed. On the basis of photographs, casts and cephalometric roentgenograms obtained on a large series of newborn babies with clefts, a classification and analysis of clefts of

the lip and palate were presented.' Universally accepted language becomes necessary in describing these conditions as the size of the rehabilitative team expands. Examples of the classifications are presented with illustrative plates and drawings. (*G.H.S.*)

SARNAT, B. G., BRODIE, A. G. AND KUBACKI, W. H. Fourteen year report of facial growth in case of complete anodontia with ectodermal dysplasia. *Amer. J. Dis. Child.*, 86, 1953, 162-169.

Serial cephalometric roentgenograms and photos taken at intervals during a 14-year study of the craniofacial development of a boy with complete anodontia and ectodermal dysplasia proved to be at least equal to small normal. A slightly less than normal nasion to anterior nasal spine dimension plus a markedly greater than normal vertical measurement within the nasal cavity proper gave the impression of a buckling of the palate, which was thought to be due to overexpansion of the nasal cavity and its accessory sinuses. Whether this is due to the type of dysplasia or is traceable to a general weakening of the facial skeleton induced by lack of normal dental function is a question that should be investigated. (*S.O.R.*)

KESSLER, H. E. Dentistry's part in speech production. *Oral Hyg.*, 43, 1953, 1080.

Dentists can utilize their knowledge of anatomy to help children correct poorly articulated speech and maintain normal speech. This is especially true when the deviant speech is related to a permanent or temporary organic condition in the oral area such as malocclusion. The relationship of malocclusion to defective speech is now under long range investigation. (*G.H.S.*)

FROESCHELS, E. The significance of symptomatology for the understanding of the essence of stuttering. *Folia phoniatr.*, 4, 1952, 217-230.

The development of genuine stuttering is described, with demonstration of the logical relationship between early and later symptoms. Imitation-stuttering differs from the genuine because of a lack of inner logic, and has a characteristic symptom 'pseudotonus.' All cases reported with pseudotoni were either imitation cases or had previous unsuccessful treatment. Proofs of the purely psychogenic origin of stuttering are: the maintenance of speech trouble in spite of disappearance of pressure, stuttering never starts at the beginning of speech, no stutterer has difficulty with sounds in the final position, in approximately 16,000 cases no two showed identical symptoms. (*A.J.B.*)

FREUND, H. Studies in the interrelationship between stuttering and cluttering. *Folia phoniatr.*, 4, 1952, 146-168.

By studying the interrelationship between stuttering and cluttering some of the findings in the older literature on aphasia-like deficiencies in stutterers may be understood as part of the syndrome of cluttering, out of which stuttering as a psychogenic superstructure may or may not have developed. Insight is gained into family predisposition for stuttering on the basis of speech, constitutional inadequacies and neurotic-tendencies. Results of studies on the frequency of stutter-clutter combinations in stutterers and their families are given. Doubt is cast on the exclusive speech pathological nature of 'cluttering,' and its personality, temperament and 'reactive' element is stressed. Individual and family predisposition to stuttering is reviewed from the points of view of 'neurotic organ choice,' Adlerian function-inferiority and psychiatric genetics. (*A.J.B.*)

GLAUBER, I. P. The treatment of stuttering. *J. soc. Casewk*, 34, 1953, 162-167.

Psychiatric treatment of stuttering as a neurotic symptom is described in psychoanalytical terms. In the case of a child who stutters, the mother is considered the 'center of the therapeutic pattern.' (*J.M.*)

SHEEHAN, J. Theory and treatment of stuttering as an approach-avoidance conflict. *J. Psychol.*, 36, 1953, 27-49.

Integrating many experiments and theoretical articles from the fields of speech pathology and the psychology of learning, the author gives a comprehensive treatment of his subject. 'The stutterer blocks or stops whenever conflicting approach and avoidance tendencies reach an equilibrium . . . The occurrence of stuttering reduces the fear which elicits it sufficiently to permit release of the blocked word, resolving the conflict momentarily and enabling the stutterer to continue . . . Treatment proceeds through an integrated psychotherapy and speech therapy, aimed at attacking feared words and situations, re-

leasing feelings, improving relationships, and freeing the individual from unadaptive goals, thereby achieving a total reduction of the fear and avoidance tendency responsible for the stutterer's conflict.' (*J.V.F.*)

STEIN, L. Stammering as a psychosomatic disorder. *Folia phoniatr.*, 5, 1953, 12-46.

In an attempt to achieve a unified concept of stammering (stuttering), it is examined from the viewpoint of psychosomatic medicine as based on the philosophical theory of identity. 'The psychosomatic schema is conceived of as a framework with several layers on which the symptoms are placed according to when they appear in time . . .'

'The basic symptom, the clonus, is described as "rhythmical" rather than repetitive, and interpreted as the outward psychosomatic aspect of archaic, infantile oral erotism. As such the clonus is equivalent with infantile babbling. The ensuing symptoms, viz., those expressive of aggression (tonoclonus, tonus), of anxiety (glottal stop, "freezing"), and the primeval erotic acts (clicks) are interpreted as reactions to the persisting erotic exhibitionism, leading to further dissolution (regression).'

'On account of the psychosomatic interpretation stammering is classified as a compulsion neurosis rather than a conversion neurosis.' (*A.J.B.*)

DETTERING, R. Psychology as metalanguage. *Etc. Rev. gen. Semant.*, 10, 1953, 176-182.

The symbolic and expressive aspects of non-verbal behavior are stressed by the author, who suggests that the field of psychology needs to describe human communication, verbal and non-verbal, more fully. (*I.E.H.*)

ANATASI, A. AND DEJESUS, C. Language development and non-verbal IQ of Puerto Rican children. *J. abnorm. soc. Psychol.*, 48, 1953, 357-366.

The language development and performance on the Goodenough Draw-A-Man test were determined for 25 boys and 25 girls of Puerto Rican extraction in a nursery school in New York City's Spanish Harlem. The results were compared with findings on 50 white and 50 Negro children in a previous study. The results indicated the Puerto Rican children did not differ significantly from the white or Negro children in IQ on the Draw-A-Man test although their parents were from lower educational and occupational levels, and they excelled the others in mean sentence length and in maturity of sentence structure. The greater amount of adult contact is suggested as a possible factor in the superior language development of the Puerto Rican children. (*V.B.C.*)

GAGE, N. L. Explorations in the understanding of others. *Educ. psychol. Measmt*, 14, 1953, 14-26.

Review of recent significant research, with bibliography, on processes by which one personality understands another, and statement of implications for interpersonal relations. Techniques are described for judging the effectiveness of counselor-clinicians in 'understanding' (predicting responses of) a client. (*J.J.V.*)

WILKINS, W. L. Films depicting mental illness. *Personnel Guid. J.*, 31, 1953, 473-474.

A series of eight films, produced by National Film Board of Canada and distributed by McGraw-Hill Text Films, illustrates patients with various types of mental illness. Reviewed as suitable for advanced students in medicine, social work, etc. (*I.E.H.*)

OLERON, P. Conceptual thinking of the deaf. *Amer. Ann. Deaf*, 98, 1953, 304-310.

Reviewing studies of the performance of the deaf in sorting tests, the author finds the following characteristics: (1) difficulty in shifting from one sorting principle to another; (2) repetition of one type of sorting, giving the impression of rigidity; and (3) difficulty in explaining the sorting principle used. He believes neither Goldstein's theory of the concrete attitude nor MacAndrews' theory of rigidity due to isolation is satisfactory. He hypothesizes that non-subordination of observed data to abstract conceptual conditions results in the difficulties. This is a mark of retarded development rather than real incapacity, and progress in the use of language and abstract terms will help the development of conceptual thinking. (*A.J.B.*)

News And Announcements

Boston University Speech and Hearing Center opens the Leighton Johnson Memorial Audiology Unit this December. This unit is made possible by a grant from the Godfrey Hyams Trust. Included in the Unit is a sound-proof room equipped for speech audiometry and hearing aid fitting. Research on voice and articulation disorders of the hard of hearing will utilize the Voice Visualizer, currently on loan from the Research Laboratory of Electronics of the Massachusetts Institute of Technology.

A Speech and Hearing Clinic, available to military personnel and their dependents, has been established at Fitzsimons Army Hospital in Denver. Robert J. Harrison and Harold J. Weber man the clinic, which is closely associated with the Neuropsychiatric Service and the Ear, Nose and Throat Clinic.

The American Hearing Society has announced that it will move its national headquarters from Washington, D.C., to Columbus, Ohio, 'as soon as possible.'

A five-year program of mobile itinerant services for speech handicapped children was launched this fall by the Nevada Society for Crippled Children. The program, made possible through an $80,000 grant from the Max C. Fleischmann Foundation, will operate in conjunction with physical therapy facilities. Marjorie Thompson is the speech correctionist for the program.

The Volta Bureau has announced the retirement of Josephine B. Timberlake, and the appointment of Alice Dunlap, as executive secretary of the Volta Speech Association and Editor of the *Volta Review*.

News and Announcements is edited by Charles R. Elliott, Northwestern University, assisted by the following committee: Jane Beasley, University of Alabama; George Gens, Newark (New Jersey) State Teachers College; Elise Hahn, University of California at Los Angeles; Earl Schubert, State University of Iowa.

Educational Testing Service has announced the establishment of a relatively autonomous division for research in personality measurement. Primary concern will be with measurement of important variables of temperament, personality, and motivation in people within the normal range.

An adult Demosthenators stuttering group has been organized by Carmen C. Dixon in cooperation with the Phoenix, Arizona, Y.M.C.A. Plans for this year include: speakers bureau on stuttering, community information service via T. V., radio and newspaper, and a stuttering prevention program.

The Arizona Society for Crippled Children and Adults has set up the first county-wide speech service program in the state. Headed by Eugene Gollnick, the program will be offered in Yuma County.

Psychogalvanic skin reflex equipment has been added to the Cleft Palate Rehabilitation Center at St. Barnabus Hospital in Newark, New Jersey. Electroencephalography-audiometry is a combination being developed at Childrens Memorial Hospital in Chicago by William Waldrop, newly appointed audiologist.

Meetings Announced

Speech Association of America, week of December 26, Hotel Statler, New York City.

Speech Association of the Eastern States, April 8-10, 1954, Penn-Sheraton Hotel, Philadelphia; March 31-April 2, 1955, Hotel Statler, New York City.

American Association for Cleft Palate Rehabilitation, May 14-15, 1954, Hotel Webster Hall, Pittsburgh.

New Materials

University Microfilms, Ann Arbor, Michigan announces that the following degree papers are available on microfilm: Peckarsky, Adeline K., *Maternal Attitudes Towards*

Children with Psychogenically Delayed Speech, Ph.D., New York University, 1952, #4527, 187 pp., $2.34; Chappell, Dorothy T., *The Use of Hypnosis in the Reduction of Spasticity in Paraplegia*, Ph.D., University of Michigan, 1953, #5020, 70 pp., $1.00; Palmer, John M., *The Intelligibility of PB Words As Read by Men, Women and Children for Normal and Hypacusic Ears*, Ph.D., University of Michigan, 1953, #5080, 92 pp., $1.15.

The Bureau for Handicapped Children, New York City Department of Health, has issued a 13-page booklet, *Recommended Standards for Audiology Centers*. New York State Department of Mental Hygiene, Albany, New York, has issued, *Haunted House*, dealing with the resolution of common fears and worries. Single copies are free upon request.

Hamilton Cameron, M.D., 601 W. 110 Street, New York 25, who has recovered from aphasia, has made available a 'Hand Chart for Aphasics' who are speechless but have no visual disability. The chart is offered gratis.

Zonolite Co., 135 S. LaSalle St., Chicago 3, Illinois, claims its new acoustical plastic, made of vermiculite and designed to be applied over existing ceilings, not only absorbs sound but provides insulation and fireproofing.

The *Cincinnati Speech Reader* is distributed monthly during the school year to promote an interchange of ideas among parents, educators, agencies and physicians about speech and hearing problems. Financed by the Cincinnati Council for Aid to the Deaf Child and issued through the public school Division of Special Education, the publication appears to be a novel venture in selling speech and hearing activities.

An obsolete switchboard, set up by a friendly telephone company, has proved useful for motivation and manipulation in speech and physical therapy work at the Lexington School for Cerebral Palsied Children in the El Monte, California, public school district.

An endless-tape-loop recorder-reproducer is being marketed to take a message and reproduce it with tape length up to two minutes on some models. For specifications write Magneloop Division, Amplifier Corporation of America, 398 Broadway, New York City.

A device for time compression of recorded material has been developed by Grant Fairbanks at the University of Illinois. Compressions of 10 per cent are not noticed by the listener and understandability remains even at 50 per cent compression.

New York University-Bellevue Medical Center offers gratis two new booklets for helping the handicapped. *Self-Help Devices for Rehabilitation* lists aids to self-dependence, and *RX for the Disabled Housewife* offers home self-help devices. The center is located at 400 E. 34 St., New York City.

Two bibliographies are available, on request, from the National Society for Crippled Children and Adults: a 24-page bulletin on *Sources of Information About the Handicapped*, and *Books and Pamphlets on Rehabilitation*.

Graduate Assistantships, Fellowships and Scholarships

This section, an annual feature of the December issue, lists part-time graduate appointments, fellowships, and scholarships specifically designated for graduate work in speech and hearing. General university fellowships and scholarships, unspecified as to area of concentration, and full time graduate positions will not be included. Only those announcements received too late for the December issue are printed in other issues.

Copy should be submitted to the News and Announcements Editor, and should include formal title of appointment, institution, and unit; dates, general duties, and remuneration; name and address of persons receiving applications. Deadline for receiving copy is two months prior to the publication date.

Assistantships. University of Florida. Eight and one-half months, starting September 15, 1954, at $133 per month. Two months starting June 15, 1954, at $133 per month. Work in the Speech and Hearing Clinic 15 hours per week. Graduate students may carry four-fifths load. Address H. P. Constans, Department of Speech, University of Florida, Gainesville, Fla.

Clinical Assistantships. University of Alabama. Department of Speech, Speech and Hearing Clinic. Starting February or September. Half-time; 20 hours per week of clinical assistance. $1,000 for regular school year; waiver of out-of-state tuition. Students may carry three-fourths normal graduate load. Address T. Earle Johnson, Department of Speech, Box 2025, University, Alabama.

Clinical Assistantships. The Pennsylvania State College. Speech and Hearing Clinic. Starting February or September. Half-time; 20 hours per week. Clinical work with adult vocational rehabilitation clients or college students. $1180 for ten months; remission of tuition. Student expected to enroll for half-time graduate course load, 10 credits per semester. Address Eugene T. McDonald, Speech and Hearing Clinic, The Pennsylvania State College, State College, Pennsylvania.

Clinical Assistantships. Purdue University. Speech and Hearing Clinic. Starting February or September. Half-time; 20 hours per week of clinical assistance. $1500 for regular school year; waiver of tuition fees. Student may enroll for 10 semester hours of graduate courses. Address M. D. Steer, Speech and Hearing Clinic, Purdue University, West Lafayette, Indiana.

Clinical Assistantships. Syracuse University. The Gordon D. Hoople Hearing and Speech Center. Twenty hours per week. $1200 plus remission of tuition. Address Louis M. DiCarlo, The Gordon D. Hoople Hearing and Speech Center, 805 Crouse Avenue, Syracuse 10, New York.

Clinical Assistantships. Stanford University. Speech and Hearing Clinic. Ten to twenty hours per week. $660 to $1500 depending on hours worked. General clinical work in speech and hearing or specialized work with cerebral palsied children. Reduced tuition for holders of assistantships. Address Virgil A. Anderson, Speech and Hearing Clinic, Stanford University, California.

Clinical Assistantship for Summer. Stanford University. Special school for cerebral palsied. Half-time work as speech therapist. $400 for eight-weeks summer session. Part-time graduate work at Stanford University expected. Reduced tuition. Address: Virgil A. Anderson, Speech and Hearing Clinic, Stanford University, California.

Clinical and Research Assistantships. Ohio State University. Department of Speech. Starting June, September, January, March. 15 to 25 hours per week; two-thirds to three-fourths graduate load, $600-$1503 for nine months; exemption from all fees except matriculation, graduation and student union. Address W. Hayes Yeager, Department of Speech, The Ohio State University, Columbus 10, Ohio.

Fellowships. University of Florida. Department of Speech. $100 to $125 per month for nine to eleven months. Student is expected to enroll for full course work. No duties beyond satisfactory pursuit of graduate requirements. Address H. P. Constans, Department of Speech, University of Florida, Gainesville, Fla.

Fellowships. State University of Iowa. Speech pathology and audiology. Half-time; 20 hours per week. $100 per month for 11 months; remission of tuition. Fellows allowed to carry 12 semester hours of course work. Applications received any time; must be received by July 1, 1954 to be considered for 1954-55 academic year. Address Wendell Johnson, Speech Clinic, State University of Iowa, Iowa City, Iowa.

Fellowships. University of Wichita (employment in the Institute of Logopedics). Duties primarily clinical. $200 to $250 per month; student is expected to pursue course work toward the M.A. degree. Address Martin F. Palmer, Institute of Logopedics, 2400 Jardine Drive, Wichita 14, Kansas.

Graduate Scholarships. Awarded for special study in cerebral palsy by Alpha Chi Omega and the National Society for Crippled Children and Adults. Grants vary between $100 and $750 for a minimum of three months at a recognized training center. Address National Society for Crippled Children and Adults, 11 South La Salle Street, Chicago 3, Illinois.

Graduate Scholarships. Awarded by the Speech Correction Fund for study at colleges or universities offering training beyond the Master's degree. $500 per year, beginning June or September; applicant must hold the Master's degree, or equivalent, in speech pathology or allied field.

Address Mrs. Marceline Jaques, Scholarship Committee, Room 1020, 11 S. La Salle Street, Chicago 3, Illinois.

Graduate Scholarships. Western Reserve University (Training at the Cleveland Hearing and Speech Center). Remission of $600 full tuition for the academic year. Applications for year beginning September 1954, received at once. Address Director of Admissions, Western Reserve University, 11105 Euclid Avenue, Cleveland 6, Ohio.

Grants-in-aid. The Audiology Foundation. Three types offered: scholarships, research grants, publication grants; to students already engaged in any branch of audiology or students wishing to enter the field. $500. Applications must originate from educational sponsors. Assurance that the student will continue to work in audiology is necessary. Address The Audiology Foundation, Box 21, Glenview, Illinois.

Internships. University of Michigan Speech improvement camp: Shady Trails. Nine weeks starting June 21, 1954. Clinical work and graduate study at the camp at Northport, Michigan. Six semester hours of graduate credit; room, board, tuition provided. Address John N. Clancy, University of Michigan Speech Clinic, 1007 East Huron St., Ann Arbor, Michigan.

Research Assistantships. Purdue University. The Voice Science Laboratory, Department of Speech. Starting February or September. Half-time; 20 hours per week of laboratory research assistance. $1500 for regular school year; waiver of tuition fees. Student may enroll for 10 semester hours of graduate courses. Address M. D. Steer, Voice Science Laboratory, Department of Speech, Purdue University, West Lafayette, Indiana.

Research Assistantships. Western Reserve University (at the Cleveland Hearing and Speech Center). Starting September 1954. Half-time; 20-hours per week. $800 for nine months; remission of nine hours tuition (maximum load) per semester. Applications for 1954-55 academic year received at once. Address Director of Admissions, Western Reserve University, 11105 Euclid Avenue, Cleveland 6, Ohio.

Research, Clinical and Technical Assistantships. State University of Iowa. Speech pathology and audiology. Starting September 1, 1954. Half-time; 20 hours per week. $900 for nine months; remission of tuition. Appointments usually continued on same basis for adjacent summer sessions if desired. Assistants allowed to carry 12 semester hours. Applications for academic year 1954-55 received until July 1, 1954. Address Wendell Johnson, Speech Clinic, State University of Iowa, Iowa City, Iowa.

Scholarships. Stanford University. Speech and Hearing Clinic. Available in speech correction and in audiology. Approximately $560. No duties. Address Virgil A. Anderson, Speech and Hearing Clinic, Stanford University, California.

Scholarships and Fellowships. Ohio State University. Department of Speech. In audiology. Starting June, September, January, or March. Up to $800 for scholarships and $1,000 for fellowships for academic year; exemption from all fees except matriculation, graduation, and student union. Student carries full graduate load. Address W. Hayes Yeager, Department of Speech, The Ohio State University, Columbus 10, Ohio.

Technical Assistantships. University of Alabama. Department of Speech, Hearing Clinic and Recording Laboratory. Starting February or September. Part-time; hours from five to 20 per week; salary determined by type and amount of work. Up to $1,000; waiver of out-of-state tuition. Address T. Earle Johnson, Department of Speech, Box 2025, University, Alabama.

Teaching Assistantships. Stanford University. Department of Speech and Drama. Starting September. Three to six hours teaching plus two to four hours conferences per week. Up to $900 depending upon load carried. Reduced tuition. Basic voice and diction work with foreign students. Address Virgil A. Anderson, Speech and Hearing Clinic, Stanford University, California.

Teaching Assistantships. Western Reserve University (Granted by the Cleveland Hearing and Speech Center). Starting September 1954, in the nursery for deaf children, ages 16 to 36 months. Half-time; 20 hours per week which includes individual therapy for deaf and severely hard of hearing. $1125 for the calendar year (three weeks vacation) and remission of tuition totalling $480 (nine hours maximum load).

Applications for 1954-55 academic year received at once. Address George J. Fortune, 11206 Euclid Avenue, Cleveland 6, Ohio.

Working Scholarships. Western Reserve University (employment at the Cleveland Hearing and Speech Center). Remuneration and working time arranged according to demands for clinical service and needs of student. Applications for the 1954-55 academic year may be made at once. Address George J. Fortune, 11206 Euclid Avenue, Cleveland 6, Ohio.

News About People

Francis L. Sonday has been appointed Assistant Professor in the Department of Otolaryngology and Director of the Clinics for Audiological and Speech Services at the Indiana University Medical Center, Indianapolis, Indiana.

Claire Cooper has joined the staff of Vanderbilt University School of Medicine as Clinical Audiologist and Instructor in Audiology. Kathryn Barth has joined the staff as a speech therapist.

Louis DiCarlo has been promoted to the position of full professor at Syracuse University.

Laura Hauptman has accepted a position as speech and hearing therapist at the St. Barnabus Hospital Cleft Palate Rehabilitation Center in Newark, N. J.

Carolyn Gregory has joined the staff of Fort Root Veterans Hospital in North Little Rock, Arkansas, as Language Retraining Therapist.

Wayne L. Thurman has joined the staff at Eastern Illinois State College, Charleston, as Director of the Speech and Hearing Clinic.

Following are the new appointments, as speech correctionists, announced for the public schools of Chicago: Delorus D. Clinton, Georgene Pree Hays, Harriett L. Kopel, Bonnie Nakamura, Marlene D. Weinstein, Caryl D. Weiss.

Joan W. Kain has been appointed speech therapist at the Bay State Rehabilitation Center of Western Massachusetts, at Springfield.

Doris Davis has accepted a position as instructor of speech and speech pathology at the State Teachers College, Mankato, Minnesota.

Leo Doerfler was recently elected a member of the Board of Directors of the American Hearing Society. Jack Matthews was recently elected a member of the Board of Directors of the Pittsburgh Hearing Society. Aubrey Epstein has joined the clinic staff at the University of Pittsburgh.

William R. Humphrey has been appointed speech therapist at the Rehabilitation Center of Worcester, Massachusetts.

CONVENTION PROGRAM

November 23-25, 1953, Hotel New Yorker, New York City

AMERICAN SPEECH AND HEARING ASSOCIATION

Sunday, November 22
All Day
(pre-convention)

Meeting of Executive Council

Monday, November 23

EVALUATION OF MODERN RESEARCH IN STUTTERING

8:45 to 10:20 a.m.

Chairman: Charlotte G. Wells, University of Missouri

Speaker: Stanley H. Ainsworth, University of Georgia
Discussion

SEMINAR: CLINICAL PROBLEMS IN AUDITORY TESTS

8:45 to 10:20 a.m.

Chairman: Raymond T. Carhart, Northwestern University

Topics: The Problem of Recruitment Testing
The Problem of Bone Conduction Testing

Discussants: Ira J. Hirsh, Central Institute for the Deaf
Scott Reger, State University of Iowa
James F. Jerger, Northwestern University
Josef Zwislocki, Harvard University

EXPERIMENTAL PHONETICS

8:45 to 10:20 a.m.

Chairman: John V. Irwin, University of Wisconsin

An Experimental Investigation of Native American Listeners' Relative Adaptation in Understanding Speakers with Foreign Dialect. Joseph B. Chaiklin, Stanford University

An Experimental Study of the Relative Sound Pressure, Duration, Intelligibility and Aesthetic Aspects of the Speech of Artificial-Larynx, Esophageal and Normal Speakers. Melvin Hyman, Bowling Green State University

A Study of the Information Content of Groups of Words. Helen Miner, Ohio Department of Health

Competing Messages: The 'Masking' of Speech by Speech. J. C. Webster, J. F. Curtis, W. Spieth, P. O. Thompson, U. S. Navy Electronics Laboratory

Contributions of the Visual Components of Oral Symbols to the Speech Comprehension of Listeners with Normal Hearing. John J. O'Neill, Ohio State University

VOICE AND ARTICULATION DISORDERS

10:30 to 12:00 a.m.

Chairman: Calvin W. Pettit, George Washington University

Voice Problems in the Public Schools. Norma Lee Lucas, Clayton, Missouri, Public Schools

Voice Problems of the Singer and Actor. Friedrich S. Brodnitz, Beth David Hospital

Speech Sound Discrimination within Words and Sentences. Charles V. Mange, Pennsylvania State College

A Comparison of Certain Motor Performances of Children with Normal Speech and Children with Defective Consonant Articulation. Keith L. Maxwell, University of Michigan

SPEECH THERAPY IN CEREBRAL PALSY
10:30 to 12:00 a.m.
Chairman: Frederic L. Darley, State University of Iowa

Reflex Inhibition as a Modality in Cerebral Palsy Therapy, with Special Reference to the Bobath Approach. Marsee Fred Evans, Birmingham-Southern College

Discussants: Juliette M. Gratke, Cerebral Palsy Treatment Center, Dallas
Martin F. Palmer, Institute of Logopedics
William G. Peacher, Syracuse University
Harold Westlake, Northwestern University

TIME COMPRESSION OF SPEECH
10:30 to 12:00 a.m.
Chairman: Gordon E. Peterson, University of Michigan

Speaker: Grant Fairbanks, University of Illinois
Discussion

LUNCHEON MEETINGS OF VARIOUS GROUPS
12:30 to 2:15 p.m.

FILM THEATER
1:00 to 4:00 p.m.
Chairman at all Film Theater sessions: Oliver Bloodstein, Brooklyn College

EVALUATING THE RESULTS OF SPEECH THERAPY
2:30 to 4:00 p.m.
Chairman: Jack Matthews, University of Pittsburgh

What is Speech Therapy? John L. Boland, University of Oklahoma

The Use of the Articulation Index for Measuring Progress in Articulation Cases. Kenneth S. Wood, University of Oregon

A Modified Articulation Index for Evaluating Progress with Cleft Palate Cases. Betty Jane McWilliams, University of Pittsburgh

The Use of the Stuttering Scale as a Means of Objectively Measuring Progress in Stuttering. Dorothy H. Sherman, State University of Iowa

Evaluating Change in Avoidance Behavior. George H. Shames, University of Pittsburgh

PANEL DISCUSSION: PROBLEMS IN AUDIOLOGIC HANDLING OF ADULTS
2:30 to 4:00 p.m.
Chairman: Aram Glorig, Walter Reed Hospital

Discussants: Jack L. Bangs, Houston Speech and Hearing Center
Moe Bergman, Veterans Administration
Louis M. DiCarlo, Syracuse University
George J. Fortune, Cleveland Hearing and Speech Center
Harriet L. Haskins, Johns Hopkins University
L. LeRoy Horne, Delaware Hospital
Claude S. Hayes, Walter Reed Hospital
Hayes A. Newby, Stanford University

SYSTEMATIC RESEARCH IN EXPERIMENTAL PHONETICS
2:30 to 4:00 p.m.
Chairman: Mack D. Steer, Purdue University

A Theory of the Speech Mechanism as a Servosystem. Grant Fairbanks, University of Illinois

Signal Reception: Intelligibility and Side-Tone. John W. Black, Ohio State University

The Importance of Dynamic Factors in the Psycho-Acoustic Analysis of Speech. James F. Curtis, State University of Iowa

Problems in the Evaluation of Speech Signals. Gordon E. Peterson, University of Michigan

PROFESSIONAL PROBLEMS
(Nine simultaneous sessions)
4:10 to 5:30 p.m.

Program Organizer: Margaret Hall Powers, Chicago Public Schools

Directors of Speech Correction in Cities of 200,000 and Over. Chairman: Dorothy G. Kester, Akron Public Schools

Speech Correctionists in Communities Under 200,000. Chairman: Marian Donewald, Evansville, Indiana, Public Schools

Directors of State or County Speech and Hearing Programs. Chairman: Elizabeth C. MacLearie, Ohio State Department of Education

Private Practice in Speech and Hearing. Chairman: Paul D. Knight, Private Practice, Chicago

Hospital and Rehabilitation Agency Speech and Hearing Services. Chairman: Jack L. Bangs, Houston Speech and Hearing Center

Directors of Speech Science Laboratories. Chairman: John W. Black, Ohio State University

Directors of University Speech Clinics. Chairman: Harlan Bloomer, University of Michigan

Supervisors of Student Practicum Training. Chairman: Elsie M. Edwards, Michigan State College

Speech and Hearing Therapists in Federal Government Rehabilitation Programs. Chairman: Merle Ansberry, University of Maryland

COUNCIL RECEPTION
5:30 to 6:30 p.m.

GENERAL SESSION
8:00 to 8:45 p.m.

Presiding: Margaret Hall Powers, Chicago Public Schools

Presidential Address. S. Richard Silverman, Central Institute for the Deaf

BUSINESS MEETING OF THE ASSOCIATION
8:45 p.m.

Tuesday, November 24

PSYCHOLOGICAL FACTORS IN SPEECH DISORDERS AND THERAPY
8:45 to 10:20 a.m.

Chairman: James F. Bender, National Institute for Human Relations

Spontaneous Imagery and Its Use in Speech Therapy. Augusta Jellinek, Mt. Sinai Hospital

Rorschach Prognosis in Psychotherapy and Speech Therapy. Joseph G. Sheehan, Calvin J. Frederick and William H. Rosevear, University of California at Los Angeles

An Analysis of the MMPI Responses of 33 Adult Male Stutterers. Milton A. Valentine, University of Colorado

Therapies Used for Stuttering: A Personal and Professional Application. Ida E. Whitten, Racine, Wisconsin, Public Schools

Symptomatic Psychotherapy in Stuttering. Charles Van Riper, Western Michigan College of Education

Discussants: Oliver Bloodstein, Brooklyn College
James V. Frick, Pennsylvania State College
A. C. LaFollette, Ohio University
Kenneth S. Wood, University of Oregon
Nancy Wood, Cleveland Speech and Hearing Center

STUDIES OF SIDE-TONE
8:45 to 10:20 a.m.

Chairman: T. D. Hanley, Purdue University

The Use of Delayed Side-Tone in Auditory Testing. C. N. Hanley, University of Washington

The Effect of Changes in Side-Tone Delay and Level upon Oral Reading Rate of Normal Speakers. Robert W. Peters, Ohio State University

The Pitch of Side-Tone. Margaret M. Mallow, Youngstown Hearing Society

A Study of Personality in Relation to Some Vocal Effects of Delayed Side-Tone. Bernard Spilka, Randolph Field

The Effects Upon Oral Reading Rate of Stutterers and Non-Stutterers of Changes in the Relationship Between Speech and Side-Tone Level. Frank B. Robinson, Miami University

The Effects Upon Rate and Level of the Speech of Stutterers of Oral Practice in Different Conditions of Side-Tone. Keith K. Neely, Defense Research Medical Laboratories, Toronto

PANEL DISCUSSION: THE TRAINING OF PUBLIC SCHOOL SPEECH CORRECTIONISTS

10:30 to 12:00 a.m.

Chairman: Dorothy G. Kester, Akron Public Schools

Discussants: Dorathy A. Eckelmann, Illinois State Normal University
Darrel J. Mase, University of Florida
Mack D. Steer, Purdue University
Virginia Thornton, Buffalo Public Schools

THE NATURE AND SCOPE OF RESEARCH IN AUDIOLOGY

10:30 to 12:00 a.m.

Chairman: Glenn J. Taylor, Illinois State Normal University

Speaker: William G. Hardy, Johns Hopkins University

Discussion

FILM THEATER

1:00 to 5:00 p.m.

LANGUAGE AND SPEECH DEVELOPMENT

2:30 to 4:00 p.m.

Chairman: Letitia E. Raubicheck, New York City Public Schools

The Role of the Home in Language and Speech Development. Dorothea McCarthy, Fordham University

The Inter-Relationships of Language Skills in Speech Development. Mildred C. Templin, University of Minnesota

Speech Sounds of Infants and Cerebral Palsied Children. Orvis C. Irwin, State University of Iowa

Factors Related to Speech Acquisition and Development in Cerebral Palsy. Philip N. Hood, Vanderbilt University

EVALUATION OF MODERN RESEARCH IN EXPERIMENTAL PHONETICS

2:30 to 4:00 p.m.

Chairman: E. Thayer Curry, University of Illinois

Evaluation of Modern Research in Motor Phonetics. George Herman, University of Michigan

Statistical Concepts in the Information Theory of Speech. Brockway McMillan, Bell Telephone Laboratories

Electrical Activity in the Nervous System in Response to Acoustic Stimuli. Walter Rosenblith, Massachusetts Institute of Technology

INTERROGATION OF "EXPERTS"

(Thirteen simultaneous sessions)

4:10 to 5:30 p.m.

Program Organizer: Frederic L. Darley, State University of Iowa

Stuttering: Wendell Johnson, State University of Iowa

Functional Articulation Problems: Katherine F. Thorn, University of Buffalo

Voice Problems: John V. Irwin, University of Wisconsin
Aphasia in Adults: Jon Eisenson, Queens College
Language Disabilities in Children: Charles Van Riper, Western Michigan College of Education
Cleft Palate: Eugene T. McDonald, Pennsylvania State College
Cerebral Palsy: Martin F. Palmer, Institute of Logopedics
Hard of Hearing: Raymond T. Carhart, Northwestern University
Services for Crippled Children: George G. Deaver, New York University
Public School Speech Correction: Hildred A. Gross, Detroit Public Schools
State and Rural Speech Correction Programs: Gretchen M. Phair, Wisconsin Supervisor of Speech Correction
Research Technique and Design: James F. Curtis, State University of Iowa
Clinical and Research Instrumentation: John W. Black, Ohio State University

FILM THEATER
8:00 to 9:00 p.m.

MEETING OF EXECUTIVE COUNCIL

8:00 p.m.

Wednesday, November 25

DIAGNOSTIC AND THERAPEUTIC TECHNIQUES
8:45 to 10:20 a.m.
Chairman: Duane C. Spriestersbach, State University of Iowa

Speech Testing in a Program of Diagnostic Procedures for Hospitalized Crippled Children. Geraldine K. Fergen, University of Missouri

The Diagnostic and Therapeutic Advantages of the Chewing Method. Emil Froeschels, Beth David Hospital

An Analysis of Relationships Between Speech and Reading Skills in Kindergarten and First Grade. Wilbert L. Pronovost, Boston University

Speech Therapy Results with Mentally Retarded Children in Special Classes. Bernard B. Schlanger, The Training School, Vineland, New Jersey

THE SCHOOL HEALTH PROGRAM AND HEARING CONSERVATION
8:45 to 10:20 a.m.
Chairman: Richard E. Marcus, University of Illinois

The Ear in Health and Disease. Richard E. Marcus, University of Illinois

Organization of a Hearing Conservation Program. Maude B. Carson, Illinois Department of Public Health

Hearing Testing Procedures. Courtney D. Osborn, Michigan Department of Health

Follow-Up. Gladys B. Fish, Pennsylvania Department of Public Instruction

ORGANIC SPEECH DISORDERS
10:30 to 12:00 a.m.
Chairman: William G. Peacher, Syracuse University

Cinefluorographic Analysis of Velar Insufficiency in Post-Operative Cleft Palate Cases. James Carrell, University of Washington

Abstract and Concrete Behavior of Dysphasic Patients and Normal Subjects, as Measured by the Goldstein-Scheerer Tests. Irwin Brown, University of Michigan

A Questionnaire Study in Aphasia Rehabilitation. Martha L. Turnblom, New York University

A Comparative Study of the Breathing and Speech Coordinations and Speech Intelligibility of Laryngectomized and Normal Speakers. Walter W. Amster and Louis M. DiCarlo, Syracuse University

Discussants: Herbert Koepp Baker, University of Illinois
Emil Froeschels, Beth David Hospital

SYMPOSIUM: METHODS AND GOALS IN AUDIOLOGIC WORK WITH YOUNG CHILDREN

10:30 to 12:00 a.m.

Chairman: Jacqueline Keaster, Children's Hospital, Los Angeles

Introductory Comments.

The Importance of Early Diagnosis in Audiologic Problems. Helmer Myklebust, Northwestern University

The Significance of Levels of Hearing Loss. Freeman E. McConnell, Vanderbilt University

Appropriate Educational Follow-Up of Children with Audiologic Problems. June Miller, University of Kansas

Parental Guidance for Parents of Children with Audiologic Problems. Gloria Hoversten, John Tracy Clinic

Recent Research in Educational Philosophy as Pertains to the Child with an Audiologic Handicap. Miriam Forster Fiedler, Clarke School for the Deaf

FAILURES IN THERAPY — CASE PRESENTATIONS

10:30 to 12:00 a.m.

Chairman: Robert W. West, Brooklyn College

Participants:

Cleft Palate, Eugene T. McDonald, Pennsylvania State College
Stuttering, Oliver Bloodstein, Brooklyn College
Aphasia, Jon Eisenson, Queens College
Cerebral Palsy, Harold Westlake, Northwestern University

FILM THEATER

10:30 to 12:00 a.m.

PRACTICAL SPEECH CORRECTION TECHNIQUES AND DISPLAY OF MATERIALS

1:00 to 2:30 p.m.

Chairman: Freda W. Neugebauer, Pittsburgh Public Schools

The Challenge of Articulation Problems. Dorothy D. Craven, Arlington County, Virginia, Public Schools

Practical Techniques in Therapy for Speech Problems Associated with Cleft Palate. Rolland J. Van Hattum, Pennsylvania State College

Stuttering Therapy Techniques Demonstrated with a Group of Elementary School Children. Gloria P. Blume, New York City Public Schools

Motivation for Carry-Over in the Correction of Articulatory Defects. Irma F. Kratovil, Chicago Public Schools

BUSINESS MEETING OF THE ASSOCIATION

2:00 to 3:30 p.m.

EXPERIMENTS IN UTILIZING CLASSROOM TEACHERS IN THE PUBLIC SCHOOL SPEECH CORRECTION PROGRAM

3:40 to 5:00 p.m.

Chairman: Zelda H. Kosh, Arlington, Virginia, Public Schools

The Development and Evaluation of a Speech Improvement Program for Kindergarten Children. Betty Ann Wilson, Lafayette, Indiana, Public Schools

An Evaluation of a Classroom Program for Teaching Selected Consonant Sounds to Primary Grade Children. Betty Wilson Philips, Dade County, Florida, Public Schools

An Objective Evaluation of In-Service Training in Public Schools. Robert McCroskey, Central Michigan College of Education

Critique of Papers Presented and Discussion of the Roles of Classroom Teacher and Speech Therapist in the Public Schools. Ollie L. Backus, University of Alabama; Letitia E. Raubicheck, New York City Public Schools

MEETING OF EXECUTIVE COUNCIL

3:40 to 5:00 p.m.

INDEX TO VOLUME 18, 1953

Journal of Speech and Hearing Disorders

Abstracts (of current articles). 78-86, 210-218, 313-315, 397-400
Adaptation effect in stuttering speech behavior and normal speech behavior, The (H. B. Starbuck and M. D. Steer) 252-255
Adaptation phenomena in therapy for stuttering, A utilization of (G. H. Shames) 256-257
Adaptation to delayed side-tone (C. J. Atkinson) 386-391
Adolescents, The use of motion pictures in effecting group adjustment changes in speech handicapped (D. E. Morley and S. Berlinsky) 38-42
American Speech and Hearing Association
  Committee on Minimum Requirements for Hearing Clinics, Report of the. 110-112
  Convention
    Announcement. 115
    Formal call for papers. 3
    Program. 227-229, 406-411
    Report of council and business meetings. 94-109
  Notices to members. 319-320
  President. S. R. Silverman. 88
  Retiring President. H. Westlake. 87
Analyzing speech sounds from words, Perceptive vs. productive skills in (R. Summers) 140-148
Aphasia, A conceptual model for the processes involved in recovery from (J. M. Wepman) 4-13
  Auditory impairment in: Significance and retraining techniques (H. Schuell) 14-21
Articulation and other developmental factors in children, The relationship between (R. W. Everhart) 332-338
Articulation for ages three through eight, Norms on a screening test of (M. C. Templin) 323-331
Atkinson, C. J. Adaptation to delayed side-tone. 386-391
Audiometric testing of hearing of school children (S. M. Wishik and E. R. Kramm) 360-365
Auditory impairment in aphasia: Significance and retraining techniques (H. Schuell) 14-21
Auditory training, The response of profoundly deaf children to (C. V. Hudgins) 273-288
Auditory training unit for preschool children, A group (T. E. Bangs and J. L. Shapley) 366-372

Backus, O. and Coffman, R. Group therapy with preschool children having cerebral palsy. 350-354
Bangs, T. E. and Shapley, J. L. A group auditory training unit for preschool children. 366-372
Basic physical systems for communication between two individuals (G. E. Peterson) 116-120
Becklund, O. *See* Irwin, J. V.
Berlinsky, S. *See* Morley, D. E.
Bloomer, H. Observations on palatopharyngeal movements in speech and deglutition. 230-246
Book reviews. 71-77, 204-209, 304-312, 393-396
Buck, M. Facial skeletal measurements and tongue carriage in subjects with repaired cleft palate. 121-132
Byrne, M. C. *See* Matthews, J.

Carr, J. An investigation of the spontaneous speech sounds of five-year-old deaf-born children. 22-29
Cerebral palsy, Group therapy with preschool children having (O. Backus and R. Coffman) 350-354

Children, Audiometric testing of hearing of school (S. M. Wishik and E. R. Kramm) 360-365
group auditory training unit for preschool, A (T. E. Bangs and J. L. Shapley) 366-372
investigation of the spontaneous speech sounds of five-year-old deaf-born, An (J. Carr) 22-29
relationship between articulation and other developmental factors in, The (R. W. Everhart) 332-338
Speech examination of a group of institutionalized mentally handicapped (B. B. Schlanger) 339-349
Children having cerebral palsy, Group therapy with preschool (O. Backus and R. Coffman) 350-354
Children with cleft palate, An experimental study of tongue flexibility in (J. Matthews and M. C. Byrne) 43-47
Cleft palate, An experimental study of tongue flexibility in children with (J. Matthews and M. C. Byrne) 43-47
Facial skeletal measurements and tongue carriage in subjects with (M. Buck) 121-132
Coffman, R. *See* Backus, O.
Communication between two individuals, Basic physical systems for (G. E. Peterson) 116-120
Comparative study of methods of estimating the severity of stuttering, A (R. V. Naylor) 30-37
Conceptual model for the processes involved in recovery from aphasia, A (J. M. Wepman) 4-13

Deaf children, The response of profoundly, to auditory training. (C. V. Hudgins) 273-288
Deglutition, Observations on palatopharyngeal movements in speech and (H. Bloomer) 230-246
Delayed side-tone, Adaptation to (C. J. Atkinson) 386-391
Developmental factors in children, The relationship between articulation and other (R. W. Everhart) 332-338
DiCarlo, L. M. and Gardner, E. F. Efficiency of the Massachusetts pure tone screening test as adapted for a university testing program, The. 175-182
Discrimination test, A picture-type speech sound (W. Pronovost and C. Dumbleton) 258-266
Dumbleton, C. *See* Pronovost, W.
Duration, frequency modulation and phonetic context, Vowel recognition as a function of (W. R. Tiffany) 288-301

Efficiency of the Massachusetts pure tone screening test as adapted for a university testing program, The (L. M. DiCarlo and E. F. Gardner) 175-182
Esophageal speech development, The objective measurement of progressive (J. M. Wepman, J. A. MacGahan, N. W. Shelton and J. C. Rickard) 247-251
Everhart, R. W. Relationship between articulation and other developmental factors in children, The. 332-338
Experimental study of tongue flexibility in children with cleft palate, An (J. Matthews and M. C. Byrne) 43-47
Exploration of group homogeneity in group speech therapy, An (G. H. Shames) 267-272
Eyeblink response as a test for hearing, The (R. Galambos, P. E. Rosenberg and A. Glorig) 373-378

Facial skeletal measurements and tongue carriage in subjects with repaired cleft palate (M. Buck) 121-132
Frequency modulation, duration, and phonetic context, Vowel recognition as a function of (W. R. Tiffany) 288-301

Galambos, R., Rosenberg, P. E. and Glorig A. The eyeblink response as a test for hearing. 373-378
Gardner, E. F. *See* DiCarlo, L. M.
Glasner, P. J. and Vermilyea, F. D. Investigation of the definition and use of the diagnosis, 'primary stuttering.' 161-167
Glorig, A. *See* Galambos, R.
Graduate theses in speech and hearing disorders—1951 (F. H. Knower) 54-62

Group adjustment changes, The use of motion pictures in effecting, in speech handicapped adolescents (D. E. Morley and S. Berlinsky) 38-42
Group homogeneity in group speech therapy, An exploration of (G. H. Shames) 267-272
Group therapy with preschool children having cerebral palsy (O. Backus and R. Coffman) 350-354

Hearing aids, Minimum requirements for hearing programs offering guidance in selection of. 110-112
Hearing of school children, Audiometric testing of (S. M. Wishik and F. R. Kramm) 360-365
Hearing programs offering guidance in selection of hearing aids, Minimum requirements for. 110-112
Hearing, The eyeblink response as a test for (R. Galambos, P. E. Rosenberg and A. Glorig) 373-378
Historical notes on speech correction in the pre-association era (P. Moore and D. G. Kester) 48-53
Hudgins, C. V. The response of profoundly deaf children to acoustic training. 272-288

Index to Volume 18, *Journal of Speech and Hearing Disorders.* 412-416
Indians who stutter, Some (E. M. Lemert) 168-174
Infants, A study of word approximations in the spontaneous speech of (W. H. McCurry and O. C. Irwin) 133-139
Investigation of the definition and use of the diagnosis, 'primary stuttering.' (P. J. Glasner and F. D. Vermilyea) 161-167
Investigation of the spontaneous speech sounds of five-year-old deaf-born children, An (J. Carr) 22-29
Irwin, J. V. and Becklund, O. Norms for maximum repetitive rates for certain sounds established with the sylrater. 149-160
Irwin, O. C. *See* McCurry, W. H.

Kester, D. G. *See* Moore, P.
Knower, F. H. Graduate theses in speech and hearing disorders—1951. 54-62

Lemert, E. M. Some Indians who stutter. 168-174
Letters to the editor. 63-70, 183-203, 302-303, 392

MacGahan, J. A. *See* Wepman, J. M.
Massachusetts pure tone screening test as adapted for a university testing program, The efficiency of (L. M. DiCarlo and E. F. Gardner) 175-182
Matthews, J. and Byrne, M. C. An experimental study of tongue flexibility in children with cleft palate. 43-47
McCurry, W. H. and Irwin, O. C. A study of word approximations in the spontaneous speech of infants. 133-139.
Mentally handicapped children, Speech examination of a group of institutionalized (B. B. Schlanger) 339-349
Minimum requirements for hearing programs offering guidance in selection of hearing aids. 110-112
Moore, P. and Kester, D. G. Historical notes on speech correction in the pre-association era. 48-53
Morley, D. E. and Berlinsky, S. The use of motion pictures in effecting group adjustment changes in speech handicapped adolescents. 38-42
Motion pictures, The use of, in effecting group adjustment changes in speech handicapped adolescents. 38-42

Naylor, R. V. A comparative study of methods of estimating the severity of stuttering. 30-37
News and announcements. 89-93, 219-224, 316-318, 401-405
Norms for maximum repetitive rates for certain sounds established with the sylrater (J. V. Irwin and O. Becklund) 149-160
Norms on a screening test of articulation for ages three through eight (M. C. Templin) 323-331

Observations on palatopharyngeal movements in speech and deglutition (H. Bloomer) 230-246

Palatopharyngeal movements in speech and deglutition, Observations on (H. Bloomer) 230-246

Perceptive vs. productive skills in analyzing speech sounds from words (R. Summers) 140-148

Peterson, G. E. Basic physical systems for communication between two individuals. 116-120

Phonetic context, Vowel recognition as a function of duration, frequency modulation and (W. R. Tiffany) 288-301

Picture-type speech sound discrimination test, A (W. Pronovost and C. Dumbleton) 258-266

Possibilities of research for public school speech therapists (M. C. Templin) 355-359

Pre-association era, Historical notes on speech correction in the (P. Moore and D. G. Kester) 48-53

Progressive nature of esophageal speech development and its objective measurement, The (J. M. Wepman, J. A. MacGahan, J. C. Rickard and N. W. Shelton) 247-251

Pronovost, W. and Dumbleton, C. A picture-type speech sound discrimination test. 258-266

Relationship between articulation and other developmental factors in children, The (R. W. Everhart) 332-338

Repetitive rates for certain sounds, Norms for maximum, established with the sylrater (J. V. Irwin and O. Becklund) 149-160

Research for public school speech therapists, Possibilities of (M. C. Templin) 355-359

Response of profoundly deaf children to acoustic training, The (C. V. Hudgins) 273-288

Rickard, J. C. *See* Wepman, J. M.

Rosenberg, P. E. *See* Galambos, R.

Schlanger, B. B. Speech examination of a group of institutionalized mentally handicapped children. 339-349

Schuell, H. Auditory impairment in aphasia: Significance and retraining techniques. 14-21

Screening test as adapted for a university testing program, The efficiency of the Massachusetts pure tone (L. M. DiCarlo and E. F. Gardner) 175-182

Shames, G. H. An exploration of group homogeneity in group speech therapy. 267-272

A utilization of adaptation phenomena in therapy for stuttering. 256-257

Shapley, J. L. *See* Bangs, T. E.

Shelton, N. W. *See* Wepman, J. M.

Side-tone, Adaptation to delayed (C. J. Atkinson) 386-391

Some Indians who stutter (E. M. Lemert) 168-174

Speech and hearing disorders--1951, Graduate theses in (F. H. Knower) 54-62

Speech correction in the pre-association era, Historical notes on (P. Moore and D. G. Kester) 48-53

Speech examination of a group of institutionalized mentally handicapped children (B. B. Schlanger) 339-349

Speech sound discrimination test, A picture-type (W. Pronovost and C. Dumbleton) 258-266

Speech sounds from words, Perceptive vs productive skills in analyzing (R. Summers) 140-148

Speech therapists, Possibilities of research for public school (M. C. Templin) 355-359

Spontaneous speech of infants, A study of word approximations in (W. H. McCurry and O. C. Irwin) 133-139

Spontaneous speech sounds of five-year-old deaf-born children, An investigation of the (J. Carr) 22-29

Starbuck, H. B. and Steer, M. D. The adaptation effect in stuttering speech behavior and normal speech behavior. 252-255

Steer, M. D. *See* Starbuck, H. B.

Study of word approximations in the spontaneous speech of infants, A (W. H. McCurry and O. C. Irwin) 133-139

Stutter, Some Indians who (E. M. Lemert) 168-174

Stuttering, A comparative study of methods of estimating the severity of (R. V. Naylor) 30-37

'primary,' An investigation of the definition and use of the diagnosis (P. J. Glasner and F. D. Vermilyea) 161-167
utilization of adaptation phenomena in therapy for, A (G. H. Shames) 256-257
Stuttering speech behavior and normal speech behavior, The adaptation effect in (H. B. Starbuck and M. D. Steer) 252-255
Summers, R. Perceptive vs. productive skills in analyzing speech sounds from words. 140-148
Sylrater, Norms for maximum repetitive rates for certain sounds established with the (J. V. Irwin and O. Becklund) 149-160

Templin, M. C. Norms on a screening test of articulation for ages three through eight. 323-331
Possibilities of research for public school speech therapists. 355-359
Test, The efficiency of the Massachusetts pure tone screening, as adapted for a university testing program (L. M. DiCarlo and E. F. Gardner) 175-182
picture-type speech sound discrimination, A (W. Pronovost and C. Dumbleton) 258-266
Test for hearing, The eyeblink response as a (R. Galambos, P. E. Rosenberg and A. Glorig) 373-378
Test of articulation for ages three through eight, Norms on a screening (M. C. Templin) 323-331
Testing, Audiometric, of hearing of school children (S. M. Wishik and E. R. Kramm) 360-365
Therapy for stuttering, A utilization of adaptation phenomena in (G. H. Shames) 256-257
Theses, Graduate, in speech and hearing disorders—1951 (F. H. Knower) 54-62
Threshold reliability of recorded sustained vowels, The (W. R. Tiffany) 379-385
Tiffany, W. R. The threshold reliability of recorded sustained vowels. 379-385
Vowel recognition as a function of duration, frequency modulation, and phonetic context. 289-301
Tongue carriage, Facial skeletal measurements and, in subjects with repaired cleft palate (M. Buck) 121-132
Tongue flexibility in children with cleft palate, An experimental study of (J. Matthews and M. C. Byrne) 43-47

Use of motion pictures in effecting group adjustment changes in speech handicapped adolescents, The (D. E. Morley and S. Berlinsky) 38-42
Utilization of adaptation phenomena in therapy for stuttering, A (G. H. Shames) 256-257

Vermilyea, F. D. *See* Glasner, P. J.
Vowel recognition as a function of duration, frequency modulation, and phonetic context (W. R. Tiffany) 289-301
Vowels, The threshold reliability of recorded sustained (W. R. Tiffany) 379-385

Wepman, J. M. A conceptual model for the processes involved in recovery from aphasia. 4-13
Wepman, J. M., MacGahan, J. A., Rickard, J. C. and Shelton, N. W. The progressive nature of esophageal speech development and its objective measurement. 247-251
Wishik, S. M. and Kramm, F. R. Audiometric testing of hearing of school children. 360-365
Word approximations in the spontaneous speech of infants, A study of (W. H. McCurry and O. C. Irwin) 133-139